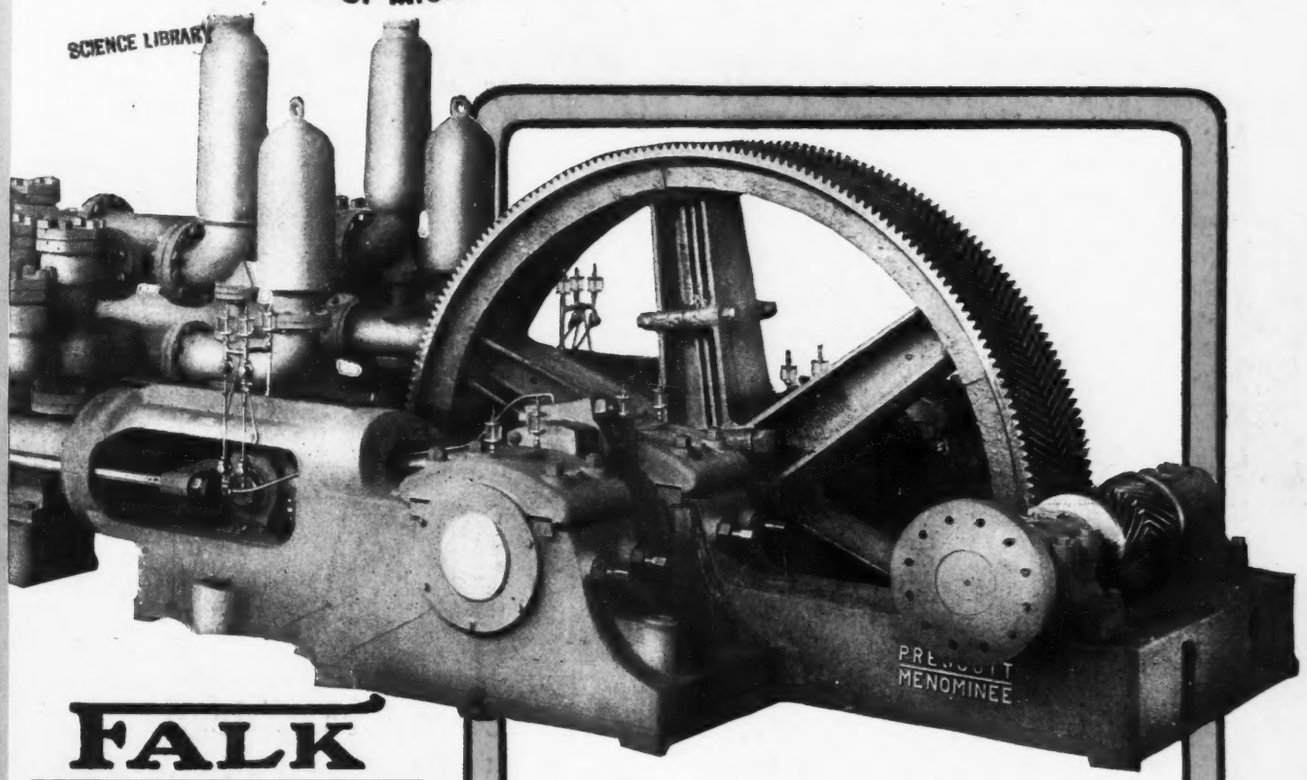
TWO SECTIONS—SECTION I

Engineering and Mining Journal

GENERAL LIBRARY

McGraw-Hill Co., Inc. Price, 20c. New York, August 2, 1919

AUG - 5 1919
UNIV. OF MICH.
SCIENCE LIBRARY



FALK
HERRINGBONE
GEARS

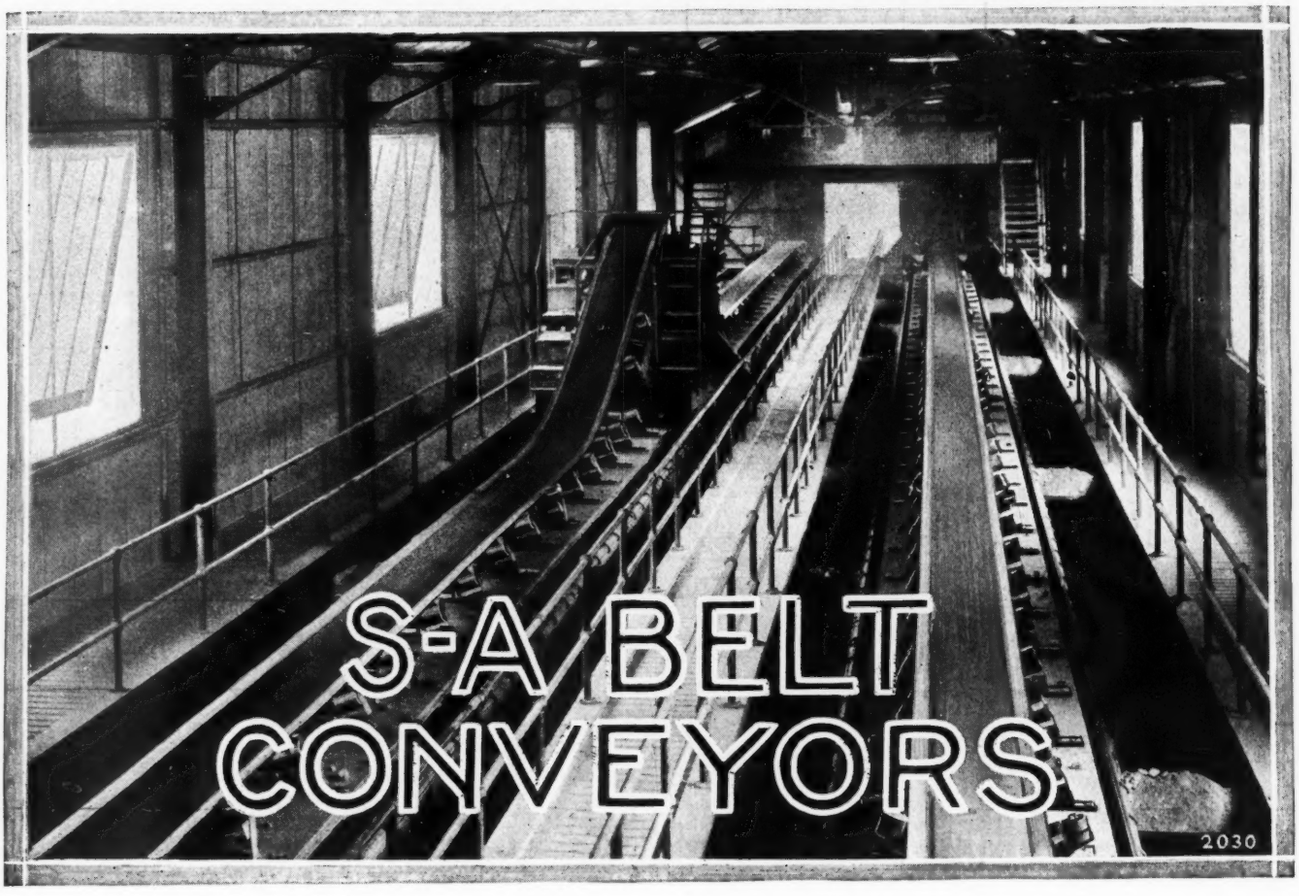
They Reduce Friction

that's one of the essential reasons for high power efficiency with Falk Herringbone drives—Falk Gears reduce friction because the greater portion of their load is carried by the teeth in rolling contact.

Then too, Falk Herringbone Gears give continuous power impulse—a smooth transmission without dangerous shock—and the Wuest Stepped Tooth Construction introduces equalized wear, the feature responsible for long service life in the Falk gears driving all kinds of mining machinery. Speed ratios as high as 20 to 1.

Write for our illustrated booklet on gear transmission.

The FALK COMPANY
Milwaukee, Wisconsin



For Dependable Service

Day in and day out S-A Belt Conveyors glide smoothly along with heavy loads of material. The S-A Self-Propelling Trippers move slowly back and forth over the bins evenly distributing the load thruout the entire length of travel.

S-A Conveyors are designed for this continuous, heavy duty service—they stand the test.

STEPHENS-ADAMSON MFG. CO.

AURORA, ILLINOIS

New York, N. Y.
Chicago, Ill.
St. Louis, Mo.
Boston, Mass.

Pittsburgh Pa.
Detroit, Mich.
Los Angeles, Cal.
San Francisco, Cal.

Cincinnati, O.
Salt Lake City, Utah.
Huntington, W. Va.
Toronto, Canada.

Vancouver, B. C.
Johannesburg, S. Africa
Sydney, Australia
Kristiania, Norway

Osaka, Kobe, Yokohama, Tokyo—India
Calcutta, Bombay, Singapore, Rangoon—India

Engineering and Mining Journal

H. C. PARMELEE, Acting Editor | WALTER RENTON INGALLS, Consulting Editor | GEORGE J. YOUNG, Western Editor | D. E. A. CHARLTON, Managing Editor | A. H. HUBBELL, E. P. McCRORKEN, EDWARD H. ROBIE, HARRY J. WOLF, Assistant Editors

Volume 108 | New York, Saturday, August 2, 1919 | *Number* 5

Is the Light Beginning to Shine?

THAT there is a limit to the wages that can be paid to a man for working a shift in a coal mine is beginning to be realized by those who secured from the British government a rise of $1.50 per ton in the price paid by the consumer. Now these miners are asking the government to wait a little while before taking such drastic action.

The theory upon which the English coal miner was working—and there are many others who support the same conviction—was this: "My food, clothing, and rent are now all very high, so I must have more money than I have been getting for my day's work. Also, there are a lot of my friends around here who have no work. If I do not work so many hours per day there will be work for them too, so I shall demand that there be fewer hours in a shift and that I get more money for the day's work. As my associates are well organized, I will get what I ask, or the plutocrat manufacturers who need the coal will get none."

This conclusion has had a hard jolt. It now looks to the miner as though the plutocrat manufacturer was not going to require any coal at all, and instead of having to work five days a week there is a fair prospect of having to rest seven days a week. Again, his union is hearing from unions in the manufacturing industries, to the effect that a coal shortage exists, because of which mills all over the country are closing and discharging their operators.

Here is a pretty kettle of fish. The miner has secured from the government the hours and the rate of pay demanded, but the mine has no orders for coal, and he is idle. Meanwhile, union brothers in other lines are urging him to get to work and get out coal so that the mills may run. Surely something is wrong.

There is a lesson in this that it may be well for our own miners to take to heart, without going through the school of experience to learn it. It is possible that the old law of supply and demand will ultimately have more to do with the fixing of the price of labor than will the members of the union. Just so long as there is a demand for the product at high prices, whether it be coal or metal, the miner can ask for high wages and the average-cost producer will pay them. When the demand slackens, one of two things will happen: the miner will either have to stop producing, or he will have to produce his raw material at a lower cost per unit. He cannot live long without producing; obviously, he will have to produce at less cost. This may be accomplished by one of two means, through charging less per hour for his labor, or by producing more units of the material in the day's shift.

From all of which one conclusion must be drawn, a conclusion from which it is hard to get away. To keep up wages and the standard of living that were brought about through war conditions, labor must become more efficient, either through using its head more, or through making its hands do more work: otherwise wages will sooner or later fall to a figure where they will buy no more than they did before the war.

It is at this point, in the matter of increased efficiency and the maintenance of wages, that a union of employers and employees would be more logical and more useful than any union of the one acting independently of, or antagonistic to, the other.

It may be granted that all miners have some aims and objects in common, as also have all those who own or operate mining property, but the miners of copper, the miners of coal, and the miners of cinnabar have nothing like so much in common as each must have with the operator of his particular kind of a mine. The interests of the copper miner and the copper-mine owner are identical. When one is prosperous the other should be prosperous. When one is on the rocks it should only be because the other is also there.

A union of this kind, where perfect confidence exists between employer and employee, may appear, at first, idealistic, but it is not impossible or impracticable.

At the recent meeting of the Canadian Industrial Relations Commission, David Rees, organizer of the United Mine Workers of America, discussed the formation of a council on which both coal miners and coal operators should be represented. He believed that it would be both possible and practicable, and that much good would result from it. The plan would be equally feasible in each of the metal-mining industries, and the possibilities for good are unlimited.

Mutual confidence and respect among the members of such a body as was proposed would be as essential as in a partnership of two individuals. If doubt of good faith exists, if one party should continually mistrust the other, no good could come of such a union. Some of the larger mining companies are approaching this conception of better industrial co-operation in their industrial relations committees, and the officials are trying to secure, and are securing for themselves, the confidence that they have in their workmen. In this program the operators are, however, confronted by the possibility of opposition on the part of officials of the larger unions of which their men form only a small minority, but with which the men feel a stronger bond than they do with their employers. And some of the larger unions, with the object of strengthening their position, keep constantly presenting to the attention of their members the strong line of cleavage that is supposed to exist between the rapacious capitalist and the downtrodden laborer. If that cleavage plane is destroyed, if there is fusion and obliteration of this imaginary boundary, the blatant type of union labor leader will lose his job and be compelled to work for a living in a less congenial atmosphere.

Collective bargaining and the large unions are here to stay. Their power for good or evil will depend upon the activities of their membership. The opportunities of leaders for efficient service are tremendous, and their duties are onerous. One of their most important functions, neglected by some leaders and feared by others, is that of building up confidence between employer and employee. There are fearless leaders—men who are not holding their positions solely for the salary attached—who are big enough to show their fellows the advantages to be gained by trusting and co-operating with their employers, and some day we believe these leaders will undertake the task. Mutual confidence and a round table will take the place of disinterested arbitration boards, and wages will be "as high as the traffic will bear."

Taking a Broad View

SOME of the resolutions adopted at the recent meeting of the American Federation of Labor were rather narrow and scarcely in accord with the principles of Americanism as we understand that doctrine, but, on the other hand, such a breadth of mind was shown in other instances that we can be sure that the American laborer of average intelligence thinks along right lines. The resolution in reference to scientific research indicates that the average intelligence of the American workman is high.

Recognizing that scientific research and the technical application of its results form the basis of industrial development—that productivity, gain, and health depend upon research and study—it was resolved by the Federation to favor "a broad program of scientific and technical research, as being of major importance to the national welfare, and such should be fostered in every way by the Federal Government; and that the activities of the Government itself in such research should be adequately and generally supported in order that the work may be strengthened and extended."

When the workman has learned that the work in the laboratory is conducted for his welfare, and not for the purpose of depriving him of his daily bread, we have reasons to feel encouraged with what has been accomplished in our public schools, for it is to them that he owes a broader vision than his father had.

Research departments will appreciate the encouragement of this resolution, knowing that they are supported both by those who work with their hands as well as by those who work with their brains.

Imperial Mineral Resources Bureau

ON JUNE 12 a charter of incorporation was granted in London to the Imperial Mineral Resources Bureau, upon the petition of the Secretary of State for the Colonies. The bureau's chief purposes are to collect and disseminate information on the resources of every mineral and metal, and to advise on the development of such resources, that they may be made available for the purposes of the imperial defense, industry, or commerce. All parts of the British Empire are ably represented in the bureau, Dr. Willet G. Miller being appointed for Canada.

The study of our own mineral resources, so intensified during the war, should be vigorously pushed in time of peace. Mineral deposits will determine industrial supremacy in the future as they have decided the course of conquest in the past, as Dr. J. B. Umpleby, special mineral adviser to the Peace Commission, recently stated. The United States today is the richest of all in mineral wealth. But as vast stretches of territory in other parts of the globe are opened, the comparison may become less and less in our favor.

The lament is often heard that the old-time prospector is fast disappearing. Would that he might remain! But, whether he goes or stays, let there be no slackening in organized effort to lay bare and develop our hidden resources.

Lest We Forget

THE Council of National Defense is to receive its unexpended balance for the fiscal year 1918 as its appropriation for 1919, under the Sundry Civil Bill, and is preparing to return to its peace-time function under the Congressional act creating it. It would have been a shame, indeed, had this product of the war been allowed to drop into oblivion. What the Allies learned from Germany under the pressure of great emergency, we, in turn, learned from them, largely through the medium and with the help of the council.

But the continuation of the council is not a matter of sentiment. There is need of an agency that will bring together and study all information bearing on the national defense. Defense, it is pointed out by the council, may not always mean war; it may mean any crisis in the life of the nation arising from unrest at home, from famine, pestilence, anarchy, or dangerous economic conditions. And with economic warfare on the horizon, industry, science, and labor must be mobilized.

Industrial Development Follows the Miner

FROM time immemorial the miner has been the pioneer in those countries fortunate enough to possess mineral resources. Throughout Europe, civilization has followed him. In Africa, industrial development is coming in his footsteps. The miner opened the treasure vaults of the Rocky Mountains from Alaska to Patagonia, and today prosperous cities dot the coast line on the eastern shore of the Pacific. May not mining do for China what it has done for the rest of the world?

Conservatism in China has long prevented anything like active development of its mineral resources, but gradually a change is creeping over her people, and the graves of ancestors are the subject of less respect than they were some years ago, if by chance they happened to be near deposits of ore.

C. W. Harvey in "Association Men" calls attention to 6,184 mining claims covering nearly 1,000,000 acres of land, a rather small area in a country of more than 4,000,000 square miles. Twenty-six mineral products are mentioned, but what is of special significance to China is the importance of her coal deposits, estimated to be large enough to furnish the world with its present annual demands for a thousand years.

With its coal mines developed, and cheap power and transportation available, the industrious Chinaman is awakening to a realization of what industrial activity lies latent in his country. If the miner is not the pioneer of industry in China, we may safely say that he will walk hand in hand with that pioneer through this latest of countries to become conscious of its mineral possibilities.

Business Training For the Engineer

THE practicing engineer appreciates the ever-increasing necessity for business training in conjunction with technical work. This fact was emphasized at the meeting of the Society for the Promotion of Engineering Education, held at Washington, on June 23 and 24. The curricula of many technical schools are deficient in all instruction save that which deals with technical subjects. Knowledge of business principles and ability to use the English language correctly are essential to the engineer. Some engineering students have the good fortune to enter their college work with adequate preparation in these fundamentals, acquired in good high schools or other preparatory institutions. However, the average engineer graduate is handicapped by a deficiency in the knowledge of business principles, and enters his commercial life at a disadvantage which has a tendency to confine his activities along narrow technical lines. Sometimes an engineer's practical experience will supply him with the training in which his university courses were deficient. Nevertheless, if the university would inculcate fundamentals of business along with technical knowledge, the engineer would be supplied with a better-balanced equipment, at a period when he could use it to the greatest advantage.

Evidence of the shortcomings of technical schools and colleges may be found in the popularity of business courses offered by numerous correspondence schools. No doubt more engineers avail themselves of these opportunities than pursue post-graduate courses in their own universities.

In these columns and elsewhere the *Journal* has referred to standardization as an important factor in efficiency, but not without the qualification that standards must sometimes be recast to met changing conditions. In the past, colleges have prescribed standard courses of study designed to prepare the engineer for service in industry, but with the increasing and broader responsibilities of the engineer, technical schools must consider the need of a new standard.

International Exposition Of Mining Industries

MINING and metallurgical engineers, and buyers of mining and metallurgical equipment, will be interested in the International Exposition of Mining Industries, announcement of which appears elsewhere in this issue of the *Journal*. The exposition will fill a long-felt want in its own particular field, and will no doubt become an important factor in the development of both foreign and domestic trade. The project deserves the support of all manufacturers of machinery used in the production of raw mineral products and their subsequent treatment.

The success of such a project depends on competent management, supported by able advisors. Too much stress cannot be laid on the necessity for exercising care and discrimination in the selection of those who are to direct the destiny of such an organization. Membership on the advisory board should be no mere honorary appointment, but each member should be chosen because he is closely in touch with some important phase of the mineral industry, or in view of his appreciation of its needs, and with the understanding that he is willing to devote to the enterprise his serious attention.

A Letter From Mexico

On the morning of July 18, Mr. Theodore Patterson, manager of the Aranzazu copper mine of the Mazapil Copper Co., of this place, was murdered in the most brutal manner by about 200 workmen of the mine.

Mr. Patterson went out on the dump of the mine, as usual, about 8 o'clock in the morning, when he was set upon by about 200 men, who began throwing stones at him from several directions, showing it to have been a prearranged plan to murder him. Mr. Patterson began backing away for the purpose of not getting in direct contact with them, and to try to get to some house where he could better defend himself. They followed him, when he drew a small pocket pistol, hoping to hold them off until he could reach safety. At this juncture someone shot him with a Mauser rifle. He then took refuge in a small house and closed the door. The bandits tore off a sheet of the roof, and threw dynamite in on him, which is supposed to have killed him, as both jaws and spinal column were found to have been broken. After they had killed him they broke the door open, stabbed and cut his body in thirty-eight places, then tied a rope to his leg, and dragged him some distance.

Mr. Patterson was an English mining engineer of the highest standing, and was loved by everyone who knew him. We buried his body here on the 19th, and said goodbye to a good man.

While committing the murder, they cried, "Kill all the English and Gringos (Americans) and bury them like cats!" The writer heard two of them (presumably) say last night, "There are three more we are going to get," but we do not know which three they are.

The Mazapil Copper Co. has in its employ more Americans than English; therefore the three others may be Americans.

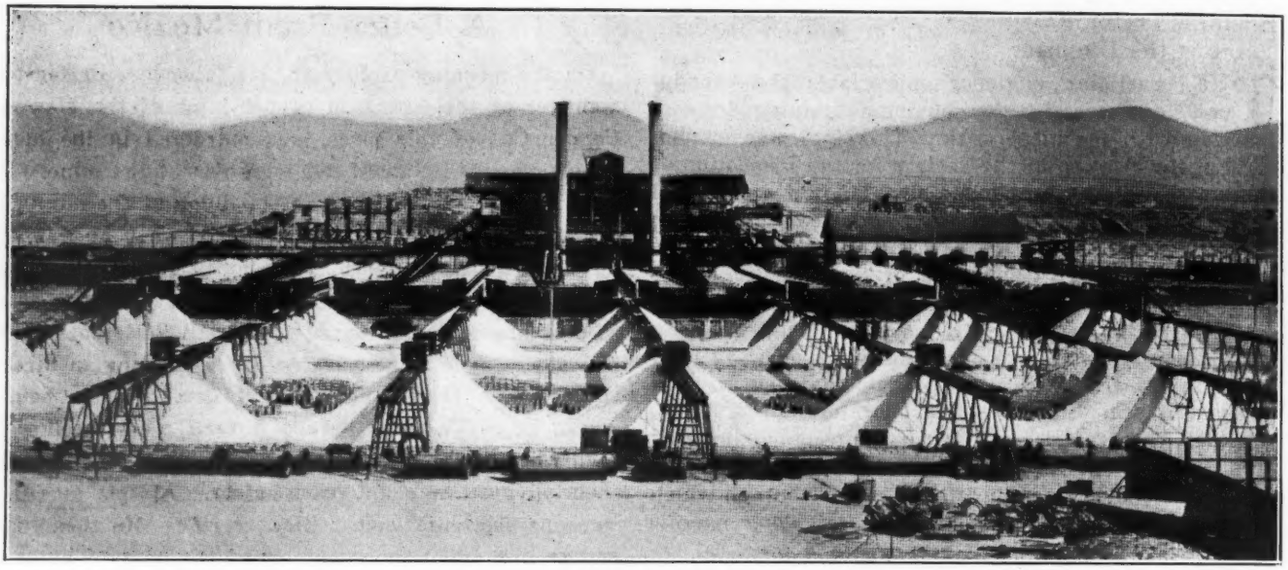
The men who murdered Mr. Patterson are all around here yet, and no apparent effort is being made to apprehend them.

I am an American citizen, have properties in the country, and I consider it my duty to call this matter to the attention of the general public.

You will do me a special favor if you will call the attention of the State Department to the facts I am giving you; they can be substantiated by all foreigners here, and by the English Consul of Saltillo, Coahuila.

It seems that the cause of the murder was that Mr. Patterson was preventing the stealing of rich ore, and for this reason they removed him.

[Signature deleted for obvious reasons. This matter has been laid before the State Department, the chairman of the Senate Committee on Foreign Relations, the chairman of the House Committee on Foreign Affairs, and the chairman of the House Committee on Rules, and all members of these committees have been provided with copies of the letter.—EDITOR.]



OFICINA "PAPOSO" AT LA NORIA (TARAPACA) CHILE. NITRATE PLANT BELONGING TO THE GRACE NITRATE CO. AND OPERATED BY NITRATE AGENCIES, LTD., IQUIQUE

The total production at this plant during March reached the unprecedented figure of 110,000 quintals of nitrate of soda. To produce this quantity of nitrate about 1,000,000 quintals of raw material is handled twice; first it is loaded into the tanks and then the refuse (about 89 per cent of the original load) is removed. This involves the handling of about 3,000 tons of material per day. (Reproduced from the "Grace Log.")

Photographs From the Field

RECENTLY COMPLETED HOIST HOUSE OF QUINCY MINING CO., HANCOCK, MICHIGAN

This building is to house the largest single-rope hoisting engine in the world. The scaffolding platform upon which will rest the hoisting engine parts as they are taken into the building shows in the foreground, the Quincy library for employees may be seen in the distant background, and the hoisting plant now in use and handling ore from a distance of 8,300 ft. immediately adjoins the new plant on the left. The new building is 100 ft. high, 72 ft. wide and is provided with a 25-ft. solid concrete foundation, 76 by 72 ft. inside. The basement cannot be shown in the picture. The building is referred to by the management as a Michigan College of Mines structure, as it was designed, engineered and constructed by Michigan College of Mines men. Cost is $75,000. A new hoisting engine built by the Nordberg Manufacturing Co., Milwaukee, Wis., will haul and hoist a distance of 14,000 ft.

The Rotary Method of Well Drilling

Widely Employed Process of Sinking Oil and Gas Wells in Unconsolidated Strata by Means of Bits Used in Alternating Hard and Soft Formations—Combining Rotary and Cable-Tool Methods

BY ALBERT G. WOLF
Mining Engineer, Gulf, Texas

IT HAS BEEN stated that rotary well drilling was invented in 1845. If so, its early development was slow, for the first oil well in this country was drilled by the percussion method in 1859, by Colonel E. L. Drake, at Titusville, Pa. In 1888, however, the rotary method was employed in a crude way in the Gulf Coast country. Two strings of pipe were used, the one to rotate the drill, and the other to wall up or case the hole as it progressed. During the next year it was discovered that thick mud, the more plastic the better, pumped into the hole through the drill stem, would support the walls until the drilling was finished, if the hole was not too deep, thus allowing the casing to be set afterward in one operation. The discovery, credited to B. Andrews, Sr., of New Orleans, La., is the most important in the development of the rotary method. From this time the process was further developed and improved in the oil fields of Louisiana and Texas, where, it is stated, in ten years more than 10,000 wells were successfully completed in formations in which it was impossible to drill and maintain a hole by any other system.

In 1900, Captain J. F. Lucas began drilling at Spindletop, near Beaumont, Tex., with a rotary rig, and in January, 1901, he brought in the first oil gusher drilled by the rotary method. This was after repeated failures had been made with cable- and pole-tool rigs. It may be, too, that the combination method was first used here, for I am informed that after this success the softer formations were drilled with rotary machines, and the hard cap-rock was penetrated by cable-tool rigs.

Another discovery of importance, and one which really made the rotary method a serious competitor of the cable-tool system in moderately hard rock, was that of the Hughes rotary rock bit. The bit was invented by Howard R. Hughes, and its manufacture started in 1909 at Houston, Tex. No other rotary bit is so effective in the harder strata, and its invention has assured the adaptability of the rotary method of drilling in fields where other than soft strata occur. In the years 1905, 1906, and 1907 its use spread all over the world, and during this period it was introduced into California. Here the requirements for drilling considerably deeper wells than the average depth in Louisiana and Texas necessitated the design and construction of heavier machines.

Each succeeding year has brought new improvements and a gradual development of still heavier machines, until now the weight of the rotary on the heaviest machines, for example, has increased nearly four-fold over that of the one used by Mr. Andrews in 1888. Even larger machines, it is thought, may be manufactured.

In the rotary method of drilling, the bit is suspended by means of a string of pipe called the "drill stem," and the bit and drill stem are rotated by the "rotary" in the center of the derrick floor. The drill stem varies in size, depending on the diameter of the hole being drilled, and is made of wrought iron and steel. The rotary turntable is revolved by a gear wheel underneath, keyed to the rotary shaft, the shaft itself being driven by sprocket-and-chain drive from the draw-works line shaft, which, in turn, is also driven by sprocket and chain, from the engine crankshaft.

The drill stem is suspended while drilling, or when it is being raised or lowered, by a cable, passing from a drum on the drumshaft of the draw-works up over the sheaves of the crown block, on the top of the derrick, and down through the traveling block. This block system of suspension is necessary to make possible handling with ease and accuracy the great weight of a string of drill stem in a deep hole. The drumshaft is driven from the lineshaft by sprockets and chains, two sets of gears being provided for two speeds. The lowering is controlled by a brake on the drumshaft.

Either one or two brake bands are provided. From the traveling block is suspended the C-hook, which in turn engages the bail of the swivel. Onto the swivel is screwed the "grief stem," "groove stem" or "Kelly joint" (the latter being the drillers' field name for it), and this is screwed into the top joint of the drill stem. The grief stem is gripped in the rotary table by a special bushing or by a set of grip rings. By the use of the latter the grief stem can be dispensed with, the grip rings taking hold directly on the drill stem. This, however, results in the serious scarring and denting of the pipe, and, too, the grip rings are more inconvenient than the grief stem with bushing, and consume more time in the operations.

When raising or lowering the drill stem, the grief stem, with swivel attached, is unscrewed from the drill stem, and the latter is suspended by means of "elevators" which hang from the C-hook. While unscrewing a joint of drill stem, or two, three or four joints together, as the case may be (the words drill stem and drill pipe being used interchangeably), the stem in the hole is held by the "slips" in the rotary until the unscrewed length is set aside and the elevators are re-attached to the drill stem. The slips, it should be added, are triangular-shaped pieces of iron with corrugated steel faces, which wedge in between the drill stem and the rotary table. The driller stands at the right of the draw-works, facing the rotary, and controls all the operations, having at hand the brake lever, two levers for operating the two drum clutches, rotary drive-clutch lever, steam throttle, and engine reverse gear.

The swivel is so constructed that it will not only allow the drill pipe to revolve but will support the entire weight of the string of tools, permitting the drill stem to be raised or lowered while revolving. At the top of the swivel is a gooseneck, connected with the manifold between the pumps by means of a wire-wound hose. Through this connection and down through the swivel and grief stem, both being hollow, water or liquid mud is pumped. This passes down through the drill stem, out through two holes in the bit, and up the outside of the drill stem, carrying with it the cuttings. Another

purpose served by the mud pumped into the hole, which gives the rotary system its great advantage over the cable-tool method in loose ground, is that of sealing up the crumbling walls of the well in an unconsolidated formation.

In the general plan of a rotary drilling outfit, Fig. 1, the derrick is centered over the well location and the rotary is placed at about the center of the derrick floor, on a firm foundation of large timbers, with the center of

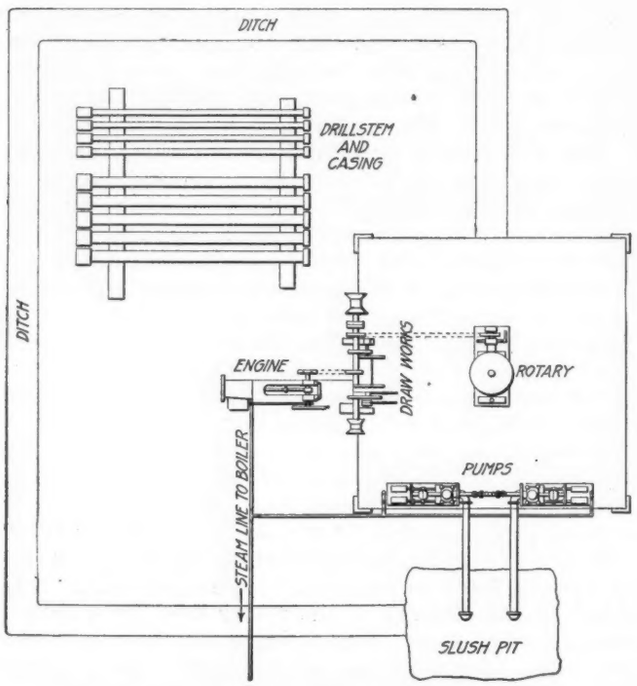


FIG. 1. PLAN OF ROTARY DRILLING RIG

the rotary table over the location point of the well. The draw-works are erected on one side of the derrick, with the engine, on a timber foundation, immediately back of them, outside the derrick floor.

The driller stands at the right side of the draw-works, facing the rotary; and the pumps, two in number, are placed on the side of the derrick floor to his right, at the edge of the floor. The pumps are duplex, and are placed end-on, with water cylinders facing. The discharges are connected by a manifold, which permits the operation of either pump. This is to make it possible to repair one pump while the other is in operation. The suctions of the pumps are connected with the "slush pit" by suction pipes fitted with foot valves and strainers at their lower ends.

A ditch leads from the well, out on the opposite side of the derrick from the pit, surrounds half the derrick, usually on the engine side, and leads back to the slush pit. This arrangement returns the water or mud to the pit, thus conserving it; prevents its overflow onto adjacent lands, and gives its sand or shell cuttings a chance to settle out in the ditch before reaching the pit, for it is not desirable to pump sand or shell into the well.

On the opposite side of the derrick from the draw-works are piled the extra lengths of drill stem and casing, all parallel with each other, and with collar ends pointing toward the derrick, for convenience in pulling onto the derrick floor and hoisting into position. On this side of the derrick, up to the top of the second bent, the center one-third of the girts and braces is cut out and the ends are joined together, leaving a high opening through which the lengths of drill stem and casing are raised and lowered as required.

The boiler is placed at any convenient distance from the rig, say 50 or 100 ft., unless natural gas in quantity is opened, when it is moved back a considerable distance to avoid the danger of fire. Usually the boiler is housed more or less roughly, according to the rigor of the climate, to conserve fuel. Fuel oil is the most commonly used fuel.

In adding to the drill stem already in the well the procedure is as follows: The string is pulled up until the lower end of the grief stem is three or four feet above the rotary, and this joint is then unscrewed. The grief stem and swivel together are then swung to one side, and the stem is lowered into a 20 or 30-ft. hole, already drilled and cased for this purpose, called the "rat hole." The bail of the swivel is released from the C-hook, and a pair of elevators of the correct size for the drill pipe substituted. A length of drill stem is pushed up onto the derrick floor, the elevators are clamped around it just below the collar, and the length of stem is swung into a vertical position just high enough for its lower end to clear the collar of the drill pipe held in the rotary. Some "dope" is put on the threads, and the new length lowered and screwed on. The entire string of drill stem is then lowered until the new piece has taken the previous place of the next lower one; the grief stem, with swivel attached, is replaced and lowered; the pump is started, and drilling resumed.

When a bit becomes dull, all the drill stem must be removed from the hole. The drill stem is hoisted and unscrewed, "broken down," in sections of one, two, three, of four pieces (called "singles," "doublets," "triplets," and "fourbles" by the crew) as the case may require and the height of the derrick permit, and set on one side of the derrick floor, standing up in the derrick. This unscrewing can be done either by hand, using chain tongs or patented tongs, or by means of the rotary and special tongs, the latter a much easier and more expeditious method.

PARTS OF DRILLING RIG

Engine—Drilling-rig engines are usually of the single-cylinder type, in cylinder sizes from 8 by 12 in., of 12 hp., to 12 by 12 in., of 30 hp. There are some as large as 16 by 16 in., of 70 hp., but they are exceptional, as is the use of more than a single cylinder engine. For rotary work the engines differ from those used in cable-tool work only in the substitution of a sprocket for the belt pulley on the crankshaft.

Draw-Works—The draw-works consist of two parallel shafts, the drum and the lineshaft. On the drumshaft are the hoisting drum, either one or two brake bands, two sprockets, and two clutches for the two hoisting speeds. The lineshaft is above and a little behind the drumshaft, and on it are usually four sprockets, one for receiving the drive from the engine, two sprockets for driving the drumshaft at different speeds (called drum-drive and quick-hoist sprockets), and the rotary-drive sprocket. Sometimes a fifth sprocket is added to drive a mud mixer. In addition, there are two cat heads or winch heads, one at either end of the shaft. The drumshaft diameter varies with the size of the rig, 5 in. and 6 in. being used for the largest rigs, and approximately 4, 4½, and 5 in. for the smaller single brake-band draw-works. Lineshafts are approximately of 3⅞ to 3¾ in. diameter, and 11 to 12 ft. long. The total

weight of the draw-works varies from about 6,000 lb. to 9,500 lb., and sometimes reaches 11,000 lb. in extra heavy draw-works for export.

Rotary—The rotary consists of a circular table of semi-steel, called the table, turntable or gear table, resting on cone bearings, and under all a heavy cast-iron foundation resting on two skids. The table is driven from below by a pinion, the latter keyed to a shaft and driven by sprocket and chain from the draw-works. By means of a clutch between the sprocket and pinion the table can be thrown in and out of gear with the line-shaft, making it possible to turn the table around by hand when necessary. In the center of the table there is a circular opening through which the tools and pipe are passed, and into which fit the slips for holding the pipe when adding or removing joints or the bushing to hold the grief stem when drilling. When drilling with grip rings, this device rests on the table, with driving posts projecting down into holes in the table top.

Modern rotaries vary in size from 14 to 26 in., the number signifying the width of the largest size bit that will pass through the central opening. The largest size pipe is two inches less. In weight, corresponding to these sizes, they vary from 2,500 to 7,800 lb. complete, or 1,650 to 4,500 lb. without the grip-ring device. These sizes and dimensions are, of course, general, as they vary somewhat with different makes. The diameters of the tables corresponding to these sizes are from 38 to 58 in. Mechanical improvements have been made in rotaries during the last few years, the more important including inclosed cone bearings instead of open ones; a better oiling system, and the use of higher-grade materials throughout.

Pumps—The slush pumps used with the rotary rig are two in number, so that one can be in operation while the other is being repacked or repaired, as the wear and tear on the pumps is heavy. The type of pump is a duplex, steam driven, varying in size from 6 by 4 by 6 in. to 13 by 7 by 14 in. The 10 by 5¾ by 12 in. size is a common one in use. Corresponding weights vary from 550 lb. for the smallest size, rarely used, to 7,100 lb. for the largest. The pumps are designed to operate against a high pressure, and have removable water-cylinder liners. Some also have changeable packing and metal valves on the water end.

Boiler—Horizontal, fire-tube boilers are generally used, and range from 20 to 50 hp., although for anything except the shallowest of holes less than 40 hp. is not serviceable. Corresponding heating surfaces are 276 to 620 sq.ft. Pressure rating is usually 100 lb., 125 lb., or 150 lb. Fuel oil or crude oil, wherever available, is the most commonly used fuel, and has several advantages over other fuels. Gas is also used to good advantage. Some of the boilers are mounted on trucks for portability, but with the larger-sized boilers these carriages break down, and are not an advantage. The boilers weigh from 5,700 lb. in the light 20-hp. size to 11,500 lb. for a 50-hp. boiler.

Derrick—The derricks for rotary drilling are not different from those used in cable-tool work. In height they vary from 66 to 130 ft., and in spread from 18 to 28 ft. The height used depends somewhat on the depth of the well to be drilled, although sometimes its size may be limited by the size of the tract of land controlled. The shorter derricks are for shallow holes, and necessitate breaking down the drill stem in doubles (two joints together). For work up to 1,200 ft., an 86-ft. derrick is sufficient, allowing lengths of three joints to be hoisted. For deeper work the higher derricks are used, although the 112-ft. derrick is sufficiently high for all but the deepest work. Derricks are built of either wood or steel, the former being by far the more common and preferred.

The building of derricks is a special branch of the carpenter's trade, and usually there are men in the field who will contract to do this work, and it usually pays to employ the contractor, for the construction of a derrick with labor unfamiliar with the work is a slow and costly job. The following is a list of contract prices for building derricks in a southeastern Texas field, the prices being for labor only, including doubling the legs and putting on double guy wires:

Size of Derrick, Ft.	Cost	Size of Derrick, Ft.	Cost
64	$75.00	85	$90.00
74	80.00	90	95.00
82	85.00	112	150.00

Derricks are usually torn down by contract also, and in this work it pays to employ skilled labor because of the greater saving of material.

Crown Block—Crown blocks are made of wood, either hard or soft, or steel I-beams, and steel pulleys. The principal members, four in number, are arranged parallel to each other, and are held apart by spacing blocks. The I-beams are 8, 10 or 12 in. high. The pulleys, five in number for rotary work, run vertically between these main members, and are arranged like the five-spots on a playing card. Pulley sizes vary, a diameter of 22 in. being common. The steel crown block is an improvement on the older wooden crown block.

Swivel—The rotary hydraulic swivel is so constructed that it can support the entire weight of the string, permit the stem to revolve, and allow water or mud to

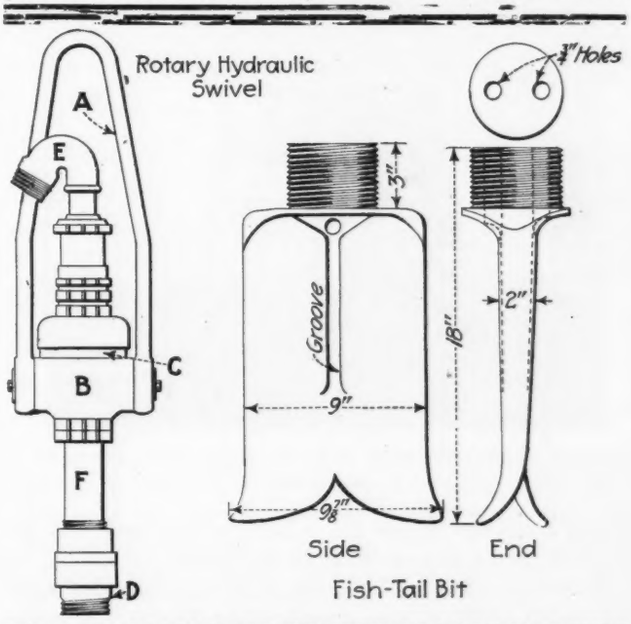


FIG. 2. HYDRAULIC SWIVEL USED IN ROTARY METHOD
FIG. 3. "FISH-TAIL" BIT

be pumped down through it under high pressure without leaking. Fig. 2 shows one form of swivel in use. It is suspended from the C-hook under the traveling block by the bail *A*, and this, in turn, supports the trunnion *B*.

On the trunnion is placed the bearing race (designed for ball or cone bearings in different makes), bearings

(inside at *C*, Fig. 2), and bearing seat. The bearings at this point must sustain the entire weight of the drill stem. Water or mud from the slush pit is pumped into the gooseneck *E*, from which it passes down through the standpipe *F*, into the grief stem at its point of connection *D*, and so into the drill stem.

The swivel is tightly held together by various lock collars, permitting the revolution of the standpipe, yet making a water-tight connection with the gooseneck, which, being connected to the hose from the manifold, cannot revolve. Swivels range in size from 3 to 6 in., the number indicating the size of the pipe connection at *D*. A 3-in. swivel weighs from 300 to 400 lb., a 4-in.

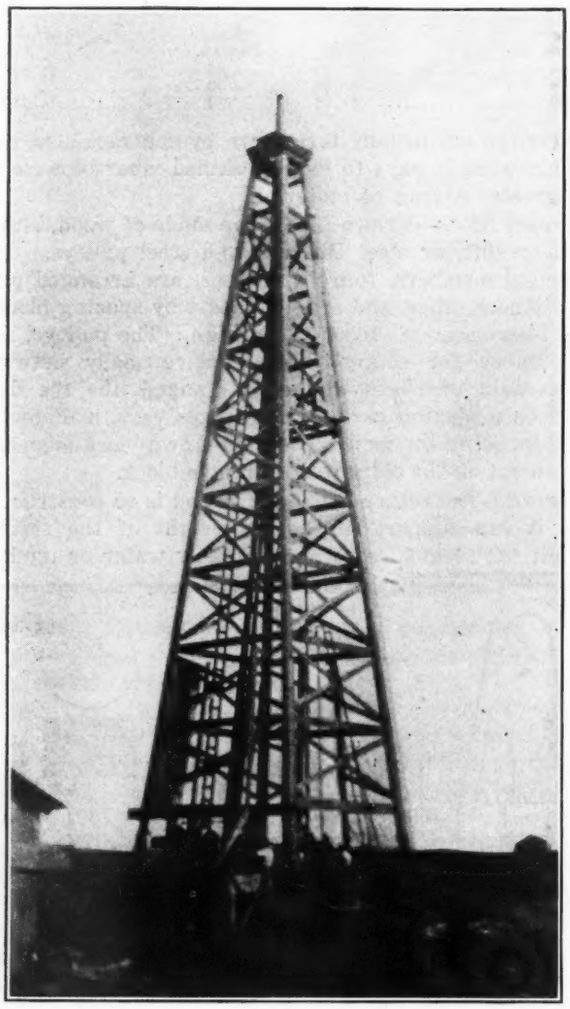


FIG. 4. DERRICK FOR ROTARY DRILLING 86 FT. IN HEIGHT

swivel from 600 to 700 lb., a 5-in. swivel from 850 to 1,200 lb., and a 6-in. from 1,350 to 1,800 lb.

Bits—The "fish-tail" bit, Fig. 3, is especially designed for rotary drilling, and though other shapes are used, it is the type most generally employed. It is made of common steel or some of the alloyed steels, but must not be brittle. All sizes, from 4- to 24-in. bits, measured across from tip to tip, can be readily procured, and smaller or larger ones may be had on special order. All dimensions vary with the width of the bit except the shank diameter, which is usually made in three or four standard sizes, for 2½-, 3-, 4- and 6-in. pipe fittings, the largest bits being obtainable only with the largest-sized shank. Shanks are also made either straight, for pipe collars, or tapered, for special tool-joint connectors.

As a bit is revolved in the well, the two fins, or cutting edges, wear against the formation, cutting it like an auger. Water or mud pumped down through the drill stem passes out through the two holes in the bit, washing the cuttings aside and carrying them up with the current. At intervals of greater or less duration, depending on the hardness of the strata, the bit must be withdrawn from the well, sharpened and tempered. The tempering is of great importance, for on it depends to a large extent the speed of drilling. If the temper is too soft, frequent changes of bits will be necessary, and, if too hard, the bit will break. If the latter should happen in a hard stratum, considerable time will be lost in "wearing out" the piece of steel. Other shapes of bits sometimes used are the diamond point and the drag bit, which somewhat resembles the bottom end of a wood auger.

In hard rock the rotary rock bits, referred to previously, are most successful. These bits have two hard-steel cones on the lower end, each cone on a shaft, leaving them free to revolve separately. The conical surfaces are corrugated, each ridge being a cutting edge divided into teeth. As the bit revolves, the two cones roll around on the bottom of the well, and the great superincumbent weight of the drill stem, grief stem and swivel causes the teeth to wear away the rock. The cones can be resharpened unless too badly worn. An improvement on the original cone bit is the reaming cone bit. This has the same cones at the bottom, and, in addition, two cylindrical cutters of the same character as the cones set in the sides of the bit above the cones. These cylinders ream the hole out to the proper gage. In drilling interstratified hard and soft formations, the cone-roller bit is the deciding factor in favor of the rotary over the percussion method.

Advantages and Disadvantages of the Rotary Method

In drilling soft strata or unconsolidated sediments, the rotary method has several advantages over the percussion. First, there is the better maintenance of wall of the hole. There is no jarring action, as with the cable or pole-tool methods, the effect of which is to loosen the material for a considerable radius around the hole, causing serious and costly caves. Pumping mud into the hole helps consolidate the soft and crumbling walls, and, where these walls are porous, the action of the water in running off through the formation carries mud with it, rapidly sealing the walls against further percolation. This prevents loss of water, and migration of water from one well to another, with the attendant troubles and damage. The mud consistency can be varied at all times to suit the character of the material being drilled. Less casing is needed, too, because of the better walls.

When drilling in soft material with the cable-tool method, casing must be carried along close to the point of drilling to maintain the well. As casing can be driven only a comparatively short distance before it is held by friction, a new and smaller string must be set every few hundred feet, extending from the top of the well, and drilling continued with a smaller bit. In the rotary system some wells have been completed to a depth of 3,000 ft. with one string of casing, and many wells to 2,000 ft., the hole diameter throughout being

maintained considerably larger than that of the casing, allowing the casing to be set with ease. This means a much lower cost per foot of well for casing, as well as a greater saving of time.

Faster time is made in soft and loose ground, because the method of cutting is more effective in this class of material; the bit is always free from cuttings, less time is consumed in setting casing, and chiefly because it is not necessary to withdraw the bit frequently and bail out the cuttings. It is claimed by advocates of the rotary method, especially manufacturers of rotary machinery, that as much as 100 ft. can be made in twenty-four hours' drilling. This is not an exaggeration. I have at hand the log of one well in which 200 ft. was made during one ten-hour shift, from 100 ft. to 300 ft. depth, in sand, shale, shell, gumbo and boulders. Another ten-hour days' work netted 120 ft. at a considerably greater depth. Where boulders are encountered in soft strata they offer no serious obstacle as a rule, because frequently they are pushed aside.

An additional advantage of the rotary system is that the driller is always informed of the exact nature of the stratum being drilled, as the cuttings are brought to the surface in a constant stream a few minutes after they are made. Thus it would be impossible for any but a slovenly driller to pass through an oil- or gas-bearing stratum without noting the fact. The cable method also is a good indicator of the strata. By the "feel" the driller can tell instantly when passing through cap-rock into a sand stratum.

In wells developing gas pressure, the hydraulic head of the mud column will often be sufficient to hold the pressure, preventing blowouts, regulating the gas flow, and permitting the drilling to be continued below this stratum. If the gas pressure is greater than the mud column will hold, a specially designed blow-out preventor can be fastened to the top of the casing, and thick mud under heavy pressure pumped in, sealing off the gas, and making it possible to resume drilling.

The rotary method gives way to the percussion process in fields where hard strata predominate, as the drilling speed attained by the rotary method is too low in such formations, and consequently the cost is too high. Also more men are required; an ordinary crew with a rotary rig consisting of a driller, three helpers, one of whom works in the derrick, and a fireman, whereas a cable-tool crew consists usually of two men, a driller and fireman. In districts having both hard rock and caving strata in quantity, a combination of the rotary and cable-tool methods is employed with great success, and will eventually be universally used under these conditions.

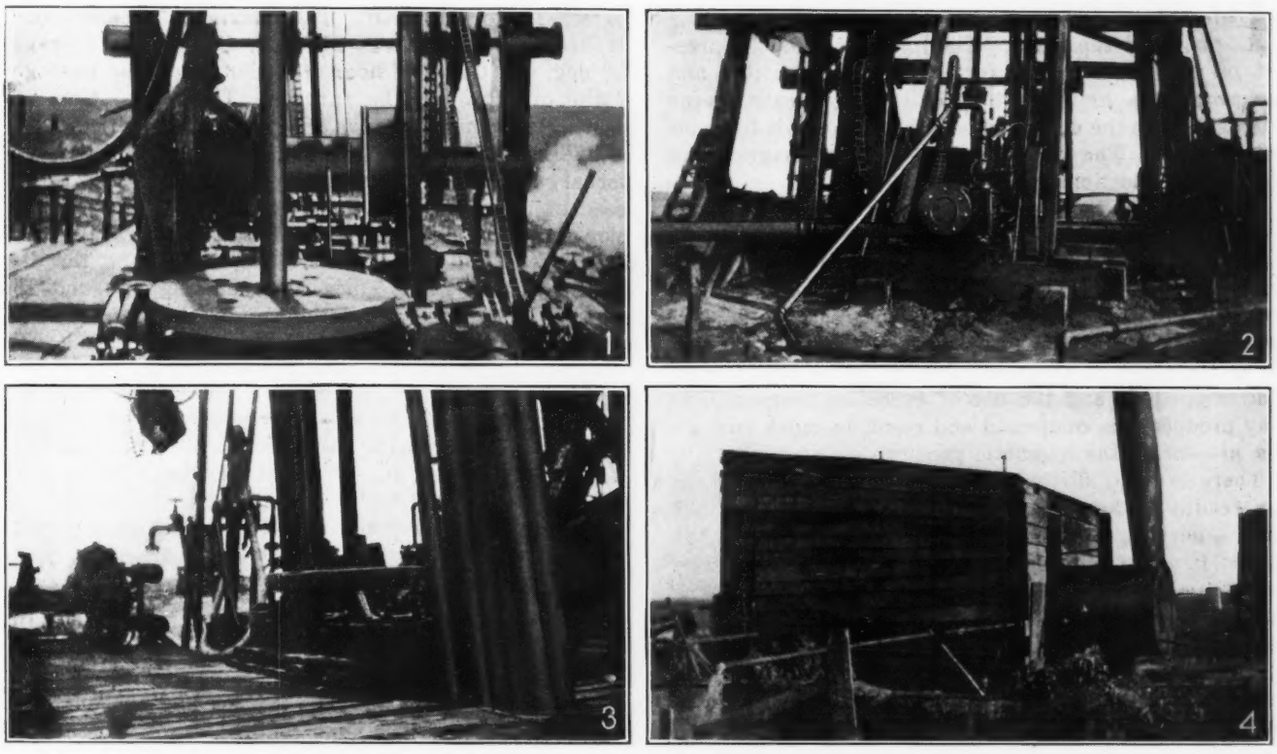


FIG. 5. (1) ROTARY IN FOREGROUND; DRAW-WORKS IN REAR; DRILLER AT HIS STATION. (2) REAR VIEW OF ENGINE AND DRAW-WORKS. (3) ROTARY IN CENTER, DRILL STEM STANDING IN DERRICK. (4) BOILER HOUSING IN GULF COAST COUNTRY

Colorado Mine Lien Law

BY A. L. H. STREET

Attorney at Law, Minneapolis, Minn.

The Colorado statutes, providing for liens against mining property for services furnished in developing such property, are so worded as to entitle a mining superintendent to a lien on a mine whose working he has superintended, holds the Colorado Supreme Court in the case of International Trust Co. *vs.* Lowe, 180 *Pacific Reporter*, 579. But it was decided in the same case that the general manager of a mining company could not enforce a lien as against holders of bonds, where he aided in the issuance of such bonds as the company's general manager.

Spain's Export of Iron Ore during 1918 was 4,292,406 tons, as against 5,137,621 tons in 1917, according to *Revista Minera*. There were exported in 1918 a total of 1,035,701 tons of iron pyrites and 22,520 tons of manganese ore.

Experiments in Magnetizing Roasting

A Magnetic Film Coating Each Individual Particle the Objective of the Process—Experimental Results of Tests Made With Pyritic Concentrate—The Preferred Type of Furnace

BY GEORGE J. YOUNG

THE separation of pyrite from blende can be effected by a magnetizing roast and the use of a magnetic separator. The minerals must be present in individual grains for complete separation, and the proportion in which they exist as separate grains will determine the degree of separation possible by magnetic means. The thoroughness of the magnetizing roast is an additional limitation.

The magnetic substances that are formed in magnetizing roasting are Fe_3O_4, mixtures of Fe_3O_4 and Fe_2O_3, $Fe_{11}S_{12}$, and FeS. Zinc ferrate, $ZnOFe_2O_3$, forms at a temperature above 600 deg. C., and is magnetic. This compound is usually not present in the roast, or is present only in small amount as the roast is carried out at a lower temperature than 600 deg. C. The presence of zinc compounds and the use of excessive temperatures may produce this compound and result in much zinc being present in the magnetic product.

There is wide latitude in the degree of roasting, as can readily be appreciated in the cut, in which *A* indicates a particle coated with a thin film of magnetic sulphide; *B*, a particle that has been roasted to a greater extent and is characterized by a thin shell of ferric oxide over a thicker film of magnetic sulphide; and *C*, a particle that has been almost completely roasted, being characterized by a core of magnetic sulphide and oxide and a spongy shell of ferric oxide. All three particles would be attracted by a magnet, but *B* and *C* represent particles that have been subjected to an unnecessary amount of roasting.

An important objection to the presence of particles coated with a spongy shell of ferric oxide is that this shell is abraded to a greater or less extent when the particles are moved in a stream. When rubbed off, the ferric oxide cannot be removed by the magnet unless some magnetic oxide is attached to the particle of ferric oxide. The objective of the roaster is to form a magnetic film that will be as adherent to the particle as possible.

TIME, TEMPERATURE AND SIZE OF PARTICLES IMPORTANT FACTORS

The important factors in roasting are the size of the particles, the temperature, and the time of roasting. Coarse particles require an appreciably longer time to heat up to the ignition temperature than fine ones. A temperature at least equal to that at which pyrite ignites must be attained and maintained for a sufficient interval of time for a film to form. The time of roasting need not be prolonged beyond this point. A few moments suffice to form the film if the temperature is high enough.

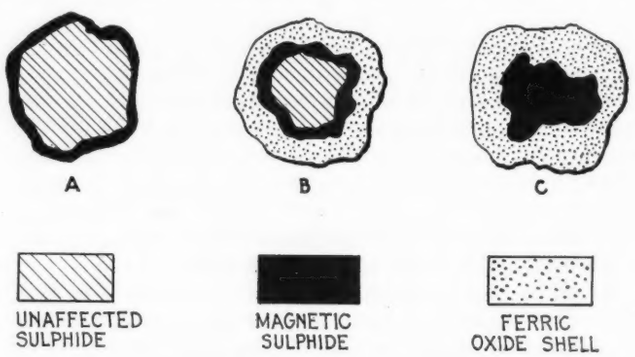
From a number of magnetizing roasting experiments that I made in the summer of 1917 I have summarized the results of three. In each experiment a 1,000 lb. lot of pyritic concentrate was taken and subjected to a roast with the object of magnetizing as much of the pyrite as possible. A rotary furnace was used.

No. 1 Roast—Clean pyrite middling, moderately coarse, 16 to 20 mesh. The maximum temperature reached in roasting was 375 deg. C. and the average 350 deg. C. One-half hour was allotted to the passage of the ore through the furnace. The actual time of roasting was much less, as the pyrite was subjected to a kindling temperature only while passing through the discharge hood of the furnace. The product was composed of particles only slightly filmed. The prevailing color was "light bronze." A 50-lb. sample, No. 1 lot, was passed through a Wetherill separator, and the division obtained was 75 per cent non-magnetic and 25 per cent magnetic. The analyses of the roasted and unroasted pyrite is given in Table I.

TABLE I. ANALYSES OF PYRITE CONCENTRATES, RAW AND ROASTED

	Insol. Per Cent.	Iron, Per Cent.	Sulphur, Per Cent.	Calculated FeS_2, Per Cent.	Calculated Fe_2O_3, Per Cent.	Calculated Insol. Plus FeS_2 Plus Fe_2O_3
No. 1 Lot:						
Raw pyrite.....	2.06	43.62	48.94	92.56	....	94.62
Roasted pyrite.....	2.66	43.31	47.73	89.49	2.20	94.35
No. 2 Lot:						
Raw pyrite.....	8.66	39.87	45.15	84.65	0.53	94.84
Roasted pyrite.....	8.52	41.29	43.77	82.07	4.27	94.86
No. 3 Lot:						
Raw pyrite.....	8.66	39.87	45.15	84.65	0.53	94.84
Roasted pyrite.....	8.12	44.02	40.35	75.66	12.44	96.22

No. 2 Roast—Pyrite concentrate, containing 8 to 10 per cent gangue minerals, both free and included in the pyrite particles. The maximum temperature reached in the roast was 440 deg. C. and the average about 400 deg. C. The time conditions were the same as on No. 1. The magnetized product obtained was distinctly brown in color. A 50-lb. sample was passed through the Wetherill separator, and the division showed 33.5 per cent non-magnetic and 6.5 per cent magnetic. Analyses are given in Table I. The results indicate about twice the thickness of film as compared with No. 1 lot.



MAGNIFIED CROSS-SECTION OF ORE PARTICLES, ILLUSTRATING DIFFERENT DEGREES OF ROASTING

No. 3 Roast—Pyrite concentrate from the same lot as used in No. 2 Roast. The maximum temperature was 500 deg. C. and the average about 450 deg. C. The pyrite was well ignited and was burning as it issued from the furnace. The roasting time was much shorter

than in the preceding experiment. The color of this product was dark brown, and practically no particles of brassy pyrite were visible. A 50-lb. sample was put through the Wetherill separator, and the division showed 7 per cent non-magnetic and 93 per cent magnetic. Analyses are given in Table I, and indicate the presence of a much thicker film than in either No. 1 or No. 2 roasts.

Five products were obtained from the Wetherill on each run, of which four were from the take-off belts and the remaining one was from the discharge of the feed belt. The products are designated *1A, 1B, 2A, 2B* and non-magnetic. The numbering is in order of sequence of the take-off belts, beginning with the one nearest the feed-hopper. The front or leading pair of poles of a pair of magnets is designated *A* and the following pair *B*. Each product was examined, and the description of the products of the separation of each was as follows:

No. 1 Roast

1 A—The particles are distinctly reddish brown; have a flat color, and are furry. No visible grains of pyrite. This product is the most responsive to the magnet.

1 B—The particles are darker than in *1 A*, and are prevailingly reddish brown. In mass they present a slightly furry appearance. Some iridescent particles and a few particles of slightly bronzed pyrite.

2 A—The particles are brown in color. The mass of grains is characteristically granular and not furry. There is an increase in the number of iridescent particles, as well as a greater number of pyrite particles that are so lightly filmed as to present little difference from unroasted particles.

2 B—A general brownish color; less flat than in the others. Granular appearance; more iridescent and pyrite particles than in *2 A*.

Non-Magnetic—Practically all pyrite grains. Some iridescent and some slightly bronzed; general appearance is like unroasted pyrite; some gangue particles noticeable.

No. 2 Roast

1 A—Reddish brown; furry; flat color; no pyrite.

1 B—Brown, granular, flat color; some bronzed and some dark blue particles of pyrite.

2 A—Brown, granular, flat color; many blue and iridescent particles.

2 B—Lighter brown than *2 A*; granular; many blue, iridescent and bronzed particles.

Non-magnetic—Light brown; some bronzed, blue and iridescent particles, but greater proportion consists of pyrite grains.

No. 3 Roast

1 A—Dark purplish brown; furry; flat color.

1 B—Dark brown; granular; flat color; many particles like bornite; many dark red particles.

2 A—Brown; lighter in color than preceding; granular; many deeply bronzed and iridescent particles.

2 B—Brown; lighter in color than *2 A*; granular; many iridescent particles.

Non-magnetic—Distinctly pyritic, although pyrite grains are coated with a brownish film, and the prevailing color is brown. Bright spots of light from pyrite faces; many clean grains of pyrite; many iridescent grains.

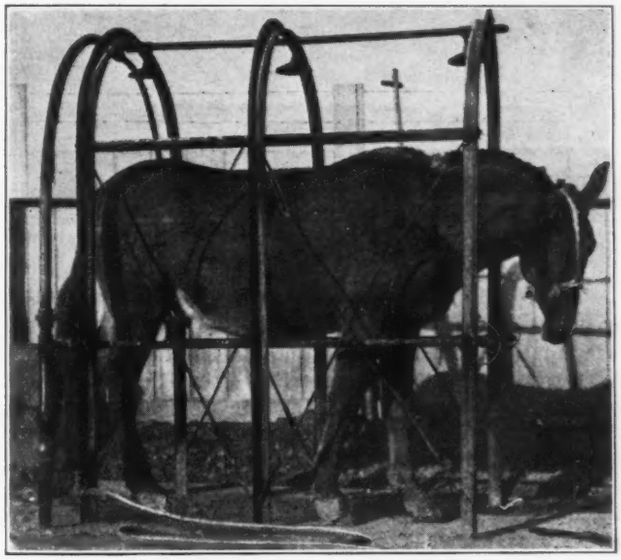
The physical appearance of the roasted product is a guide to the roaster. Good magnetizing roasting is indicated by the absence of characteristic pyrite particles and by a flat or dead color, which ranges from a bronze, through shades of purplish brown, to black. Black is characteristic of a deficiency of air during roasting, or, in other words, of reducing atmosphere.

The color of the roasted product is also influenced by the amount and color of the other minerals present, which may or may not be altered in roasting. A high degree of magnetic susceptibility is shown by the product assuming a furry appearance after it has passed under the magnet. All of the leading pole products obtained from No. 2 and No. 3 roast presented this appearance.

Almost any type of roasting furnace can be used, providing the charge is passed through quickly enough. Furnaces of a type like the old White-Howell should give good service. In my opinion, the discarded Stetefeldt shaft furnace, or some modification of the Gerstenhofer kiln, would be suitable for magnetizing roasting.

Shower Bath for Mine Mules

A shower bath for mine mules has been installed in some of the properties of the U. S. Steel Corporation and some of its subsidiaries. This provides an efficient and easy method for the removal of dirt and perspiration from the mule, the accumulation of which



DETAIL OF APPARATUS FOR PROVIDING A SHOWER BATH FOR HORSES, MULES, OR CATTLE

is unavoidable. Humane treatment and attention to the physical wellbeing of these animals undoubtedly prolongs their life and increases their efficiency. The three perforated nozzles shown in the illustration are sufficient to spray the mule's entire body while the animal remains in the position shown. This illustration is reproduced from the Bureau of Safety, Sanitation and Welfare of the U. S. Steel Corporation.

The Amount of Water Remaining in Flotation Concentrate after passing the ordinary drum filter is subject to wide variation. Concentrate made from ores containing a great deal of colloidal matter gives the most trouble. At the Vindicator mill in the Cripple Creek district, for example, the moisture in the filter product is around 30 per cent. With clean ores and a liberal proportion of coarse table concentrate in the feed, the moisture in the filter cake is sometimes reduced to even less than 10 per cent.

Deep-Level Development in Aspen

Silver-Ore Deposits in Sedimentary Rocks—Concentration by Jigs and Tables—Flotation Applicable Separation From Barite—Cost of Pumping Prohibitive—Drainage Effected by Adits

BY FREDERICK W. FOOTE
Mining Engineer, New York City

ASPEN is one of the oldest mining camps in the State of Colorado. In 1879 prospectors and pioneers went over from Leadville and located several claims, among which were the Durant, Iron, Spar, Monarch, and Smuggler. At first, Ashcroft, 12 miles south of Aspen, was the larger camp, but in 1881, upon hearing of the continued strikes of ore, Ashcroft was moved house by house down the canyon of Castle Creek to Aspen.

TOWN OF ASPEN, COL.

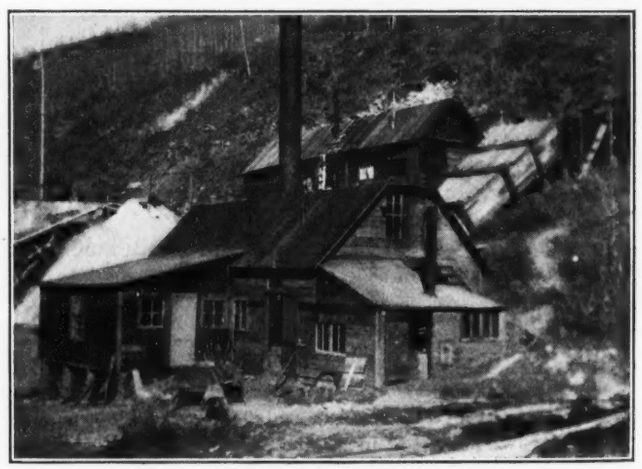
Ashcroft is now deserted. At the height of its prosperity Aspen boasted a population of 14,000. The prosperity of the camp increased and the shipment of high-grade ore in pack trains became so great that both the Denver & Rio Grande R.R. and the Colorado Midland R.R. started spurs to reach Aspen, the former from Glenwood Springs and the latter from Basalt. The railroad building became a race to see which one would run the first train into Aspen. In spite of its greater length, the Denver & Rio Grande R.R. reached Aspen first, in 1887. The Midland arrived a short time afterward. Competition between these roads has always given Aspen the advantage of low freight rates for its products. As the camp came into prominence as the premier silver producer of Colorado, and the value of its deposits became better recognized, much litigation ensued between claimants under apex rights and those under side-line rights. Money was spent freely by both sides in development work to prove their theories.

ELEVATION OF ASPEN IS 8,000 FEET

Aspen is situated on the western slope of the Rockies in a basin formed by the junction of the valleys of Castle Creek with Hunters Creek and the Roaring Fork River. A broad, flat, alluvial plain at an elevation of 8,000 ft. affords an ideal site for a town. It is protected on three sides by mountains, the opening being on the west side down the Roaring Fork to Glenwood Springs. Recently, since the Government has controlled the railroads, the service of the Colorado Midland R.R. has been suspended so that the daily "mixed" train of the Denver & Rio Grande is the only connection with main-trunk lines.

At an early date it was realized that the continued success of Aspen as a silver camp depended to a great extent upon a proper and comprehensive understanding and interpretation of the geology of the district, which was found to be complex. The Government intervened, and in the summer of 1895 sent J. E. Spurr and G. W. Tower, Jr., to Aspen for the Geological Survey. The report of their six-months' field work was published as "Monograph 31" of the U. S. Geological Survey.

The ore deposits occur in sedimentary rocks, the strata of which do not vary materially from those found in other parts of Colorado. In addition, certain igneous formations are found in definite relation to these sedimentaries. Porphyry, diorite, and granite are found in the region. These sedimentary and igneous rocks have been subjected to severe faulting both before and after mineralization. In addition to these are slips or faults along the bedding planes of certain of the strata. Of these bedding faults, the two most important are the silver and contact faults, along which perhaps 75 per cent of the ore in Aspen has been found, more particularly at the intersection of these faults with pre-mineral north and south faults. The surface ores consist of oxides, sulphates, and carbonates, and at lower depths the sulphides are found. The ores of Aspen are essentially silver ores, the principal deposit being argentiferous galena, but appreciable quantities of silver-bearing pyrites and chalcopyrite are found. Barite (heavy spar)



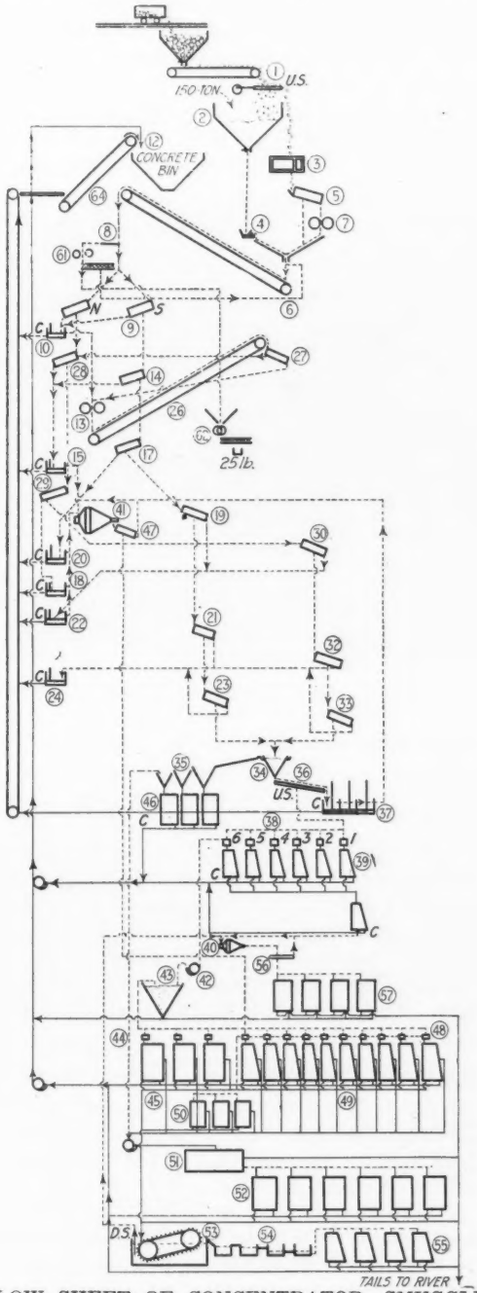
THE POWER PLANT AT HOPE TUNNEL

is found associated with polybasite, and showings of spar are consequently considered a good indication of ore.

At the height of its prosperity Aspen was producing 8,250,000 oz. of silver annually and 4,500,000 oz. at the time of the crash in 1893. The production had fallen to 575,000 oz. in 1916, this coming from 12 mines, among which were the Durant, Spar, and Smuggler, all of

which were located in 1879. Mining is conducted on the leasing system, on a variable basis of royalty. High-grade ore is shipped to the smeltery at Leadville or Pueblo, and the low-grade ore to the concentrating mill of the Smuggler Leasing Co. This has a capacity of 400 tons a day and is operated by direct-current motors of a total of 200 h.p., operating at 550 volts.

The mill is operated according to the following flow sheet, which is the result of many changes and redesigns by William Cornwall, mill superintendent for the Smuggler Leasing Co. It represents the best prac-



FLOW SHEET OF CONCENTRATOR—SMUGGLER LEASING CO.

tice for the concentration of Aspen ores: The ore is first dumped from cars on the railway track into an unloading bin, from which a traveling pan conveyor delivers it into a 24 by 48 in. crusher ore feeder (No. 1 in cut), bars set 1 in. apart. The feeder has a 6 in. stroke, 30 to the minute. The undersize from the crusher goes to an ore bin (No. 2) having a capacity of 150 tons. The oversize from No. 1 goes to a 10 by 20 in. Farrell crusher. This operates at 300 r.p.m. and crushes to 1¼ in. It is equipped with manganese-steel plates. The product from the Farrell crusher goes to a trommel conveyor. The oversize from this trommel goes to roughing rolls (No. 7) 36 by 16 in. set at ¾-in. opening. The product from this crusher goes to a bucket elevator (No. 6). Under the bin (No. 2), of 150 tons' capacity, is a 36-in. disk ore feeder (No. 4) operating at 15 r.p.m. This feeds into the bucket elevator. The first 40 in. of the trommel is made up of ¼-in. steel plate, followed by 30 in. of 25 mm. screen and then 29 in. more of ¼-in. steel plate. The undersize from this trommel goes to the bucket elevator. This is made up of 6 by 12 in. Salem buckets spaced 16 in. apart on a 14-in., 8-ply rubber belt. This elevator is operated at a speed of 375 ft. per min., with a vertical lift of 59 ft. The discharge from the elevator passes through an automatic sampler (No. 8), which takes four splits every five minutes, equivalent to about 10 tons per 24 hours.

JIGS USED ARE OF GERMAN MAKE

The ore is next trommeled and jigged (No. 9-29); 16 mm., 12 mm., and 8 mm. are the openings in the successive screens. The screens are all set at a 12° pitch and operated at 16 r.p.m. The jigs are of German make and were brought to Aspen in the early '80s. They are four-compartment, of the Harz type, and of massive construction. In this jigging operation the length of stroke is shortened as the feed becomes finer, whereas the rate of stroke is increased. The concentrates from all jigs go, by means of a drag-chain conveyor (No. 12), to a loading bin. The jig tailings are treated in a 6-ft. Hardinge mill (No. 41). The pulp from this mill goes to a 20-mesh Callow screen, the oversize being returned to the mill, and the undersize is subsequently classified and tabled. The undersize from the final trommeling goes to a 4-ft. tank (No. 34). The slime overflow from this tank goes to a three-compartment spitzkasten, and the sands to a 30-mesh duplex Callow screen (No. 36). The oversize from the screen goes to a 3-compartment sand jig (No. 37). The undersize from the screen goes to six pocket classifiers (No. 38) feeding six Hallett tables (No. 39). The concentrates from these tables go to the concentrates bin, and the tailings are retabled and then reground in a 4½-ft. Hardinge mill (No. 40). The overflow from the last pocket of the classifiers is pumped by means of a centrifugal pump (No. 42) to a 12-ft. diameter cone tank (No. 43). The pulp from this tank is discharged through a siphon to a set of three pocket classifiers (No. 44) which feed one corrugated and two smooth-belt Frue vanners (No. 45). The overflow from the tank goes to a spitzkasten which feeds three smooth-belt Frue vanners (No. 46). The concentrates from all the tables are conveyed by shaking pans to common junction points, where they are elevated to the concentrates bin by Frenier pumps.

The undersize from the 6-ft. Hardinge mill is classified and tabled on nine Hallett and one Wilfley tables (No. 48). The slimes are treated on three 6-ft. Frue vanners. All the slime water in the mill is collected and pumped by means of a 5-in. centrifugal pump to a 30 by 12 ft. Dorr thickener (No. 51). The pulp is treated on Frue vanners. The mill tailings are all collected into a 5 by 18 ft. drag classifier (No. 53), the overflow from which is pumped to four 8-ft. settling tanks. The pulp from these tanks, 95% of which is minus 80 mesh, is treated

on four Hallett tables. The oversize from the classifier goes to the 4½-ft. Hardinge mill for finer grinding and thence through a 40-mesh Callow screen to three Hallett and one Deister Overstrom slime tables. This is the final treatment, the tailings from these tables being sluiced into the river.

The discharge from the automatic sampler is crushed and split until a 25-lb. sample is obtained, the remainder being returned to the mill feed. On a feed containing 2 oz. silver and 8% lead, this flow sheet accomplished an extraction of 68% of the silver contents and 94% of the lead. The method illustrates the advantage in close sizing and saving the metallic contents in as large particles as possible, and thus reducing slime losses to the minimum.

Deep-Level Tunnels Are Characteristic of Colorado Mining

As the older mines in Aspen were worked down to a point where pumping costs became prohibitive, the question of deep-level tunnels was considered. Deep-level tunnels in Colorado have had a successful history. The Camp Bird, at Ouray; the Roosevelt, at Cripple Creek; the Yak, at Leadville, and the Newhouse, at Idaho Springs, have all rejuvenated their districts. The area to the south of Aspen along Castle Creek contained several paying mines that had been worked to shallow depths, but in which the work had been stopped by too much water and the low price of silver.

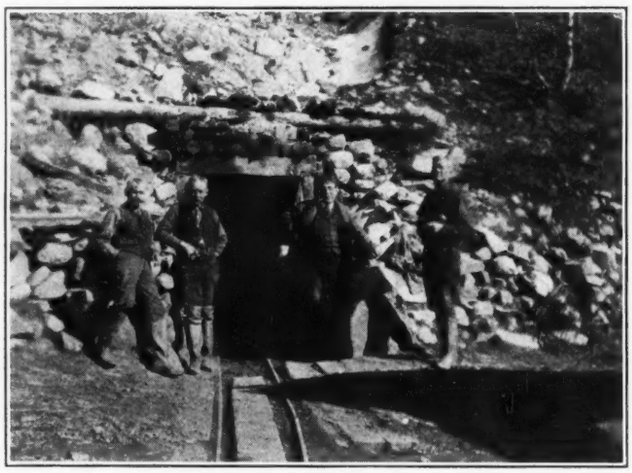
Seven miles from Aspen the Little Annie mine had been worked to a depth of 200 ft. and then discontinued after several hundred thousand dollars' worth of high-grade silver ore had been taken out. B. Clark Wheeler started a tunnel from the banks of Castle Creek to cut these workings at about 2,000 ft. depth, but after going 900 ft. the work on the tunnel was abandoned. The enterprise was too large for his resources. In 1911 a co-operative company was formed of citizens of Aspen, known as the Hope Mining, Milling and Leasing Co. This company took over the Little Annie mine, mill, and holdings and Wheeler's old tunnel, and continued the tunnel into the mountain without interruption. In March, 1919, this tunnel had attained a total length of 9,100 ft. Annual footages and costs are shown in Table I.

TABLE I. HOPE TUNNEL PERFORMANCE

Year	Footage	Cost per Foot
1911 (1 mo.)	15	.....
1912	715	$12.89
1913	1724	10.20
1914	1340	10.91
1915	1138	11.89
1916	1252	12.91
1917	1047	14.58
1918	915	17.16
Total, Hope	8146	Average $12.93
Famous	900	
	9046	

This record for a 4 by 7-ft. tunnel for seven consecutive years speaks well for the ability of the men who are driving it. Drilling is by machines, and tramming by hand. A steam-power plant of 80 h.p. is used to supply the power for the air compressor. A ventilating fan is used, driven by the waste water from the tunnel. When this tunnel has proceeded a few hundred feet further it will be 2,000 ft. under the Little Annie mine on the downward extension of the Little Annie vein. A geological examination made in 1917 showed no reason to anticipate any difficulty in finding the orebody at this depth, and connecting with the Little Annie mine.

Four miles south of Aspen the Midnight Mining Co. is driving a tunnel in from Queens Gulch (a tributary to Castle Creek) to connect with the Midnight shaft, which is on the extension of the Annie contact. When completed, the tunnel will be 5,200 ft. long and will cut the vein at a depth of 900 ft. about 800 ft. north of the shaft. From this point the tunnel will follow the vein to the shaft, thus opening up a block of ground 800 ft. long and 900 ft. deep. Three thousand feet of this tunnel has already been driven. The power plant at this tunnel consists of a crude-oil engine operating an air compressor. A comparison of power costs in 1917 showed that the steam generated by coal power used at the Hope tunnel was 1.46 times more costly than the fuel-oil power at the Midnight tunnel. Several good showings have been disclosed in both tunnels, but have not been developed, all funds being applied to the sole object of advancing the tunnels toward their objectives.



ENTRANCE TO HOPE TUNNEL

On Aspen Mountain, just south of Aspen, the Park Tunnel Mining and Milling Co. is driving a tunnel in a southeasterly direction to undercut the Tourtelotte Park properties. The tunnel portal is at an elevation of 9,500 ft. and, when finished, will be 3,000 ft. long and 800 ft. below the surface and 50 to 75 ft. below the lowest present workings in Tourtelotte Park. The tunnel is already driven to a distance of 735 ft. Electric d. c. current is used from the power plant of the Roaring Fork Electric Light and Power Co. for all power requirements. Data relative to these three tunnels is shown in Table II.

TABLE II. DATA ON ASPEN DEEP-LEVEL TUNNELS

	Hope	Midnight	Park
Length when completed, ft	9500	5200	3000
Length completed to March, 1919	9100	3000	725
Length to be driven	400	2200	2265
Size of tunnel, ft	4x7	4x7	5x8
Depth below surface, ft	2000	900	800
Power	Coal-Steam	Crude Oil	Electric

Aspen ores have been tested by flotation, and a commercial process has been worked out whereby low-grade sulphide ores (which are found at depth) can be recovered. By a combination of flotation and gravity concentration, a concentrate free from barite is obtained.

Now that the Government restriction on the price of silver has been lifted, an impetus should be imparted to silver mining that will bring Aspen back to its former prominent position. The deep-level tunnels will open up many years' supply of available ore which has not yet been developed.

Water Rights in Mining

Legal Elements Defining Ownership in Water—Basic Decisions of Courts and Rulings of State Authorities

BY CHESLA C. SHERLOCK

THE courts have long recognized the fact that water is an important element in mining operations. The U. S. Supreme Court has said that the right to use water in mining operations is beyond dispute, but that the use of water in this sense is a public use within the legal meaning of the term. The California court has said that the water of streams in mining regions cannot be made the subject of private ownership so long as it continues to flow in its natural course, but that a right may be acquired to its use, which will be regarded and protected as property, although it does not carry with it any specific property in the water itself.

This view is general among the courts. The property is in use or the right of use, and not in the water itself. Although it may be difficult to draw the distinction in some cases, it is easy to do so in others. Water is a public commodity—something that is owned only by the sovereign or state. It belongs to all, with equal right; hence the property in it cannot pass to individuals so long as the water remains in its natural course, the property in it still being reserved to the state, although the right to use may be acquired by another.

No technical method is required by which the right to use is to be acquired. All that is necessary is the mere appropriation of the water to one's own purposes. One view which the courts take, and which is followed in a great number of jurisdictions, is that the right to use, when once acquired, is a franchise—"like that of digging gold, and is founded on a presumption of general grant from the sovereign and a license from the state."

The right to the use of water is subjected by the courts to a given test, which may be announced as a general rule of procedure. The first test is appropriation and the second test is the use of the water itself. If the water has been appropriated but not used, no right is acquired which can be recognized at law. If no appropriation has been made, but merely an intent to appropriate exists, no right of use is acquired in the water. The courts have likewise said that it is improper to say that the tests to follow are the method and place of the use, these not being sufficient to acquire legal rights in the water.

It is well to keep in mind that the right to use water as outlined above can be acquired only from water of the public domain, and cannot apply to water already under appropriation by another or to water exclusively owned by another.

The Utah court has said that percolating water, so long as it remains in an artificial tunnel or mining claim of the proprietor of land, is not open to the appropriation by another. The Revised Statutes of the United States provide that when rights for the use of water in mining operations have vested, or have been recognized by local custom, laws, or decisions of the courts, the right of way for the construction of ditches shall be confirmed. In Colorado it has been held that all patents are subject to such vested rights in the use of water, but though a vested right in the use of water may carry with it an appurtenance to the right of way for the ditch through which the water is diverted, it does not carry a right to the land itself.

But mere appropriation will not operate to vest rights in each and every instance. It is effective only when (1) no riparian rights have intervened and (2) no prior rights are invaded. This is to say, if the access to the water is in the hands of a riparian owner at the time the appropriation is made, such appropriation will not vest any rights in the appropriator, and the same is true if such appropriation invades prior rights reposing in other individuals. In other words, appropriation itself is subjected to the rules of priority, and the first to exercise the right is the one to whom the fullest measure of protection is extended by the law.

It has been held that where an owner is entitled to divert water for his own use he may do so in any manner and may change the point of diversion, provided the rights of others are not injuriously affected. In Colorado and Nevada it has been held that the right of appropriation relates to the time when the first step is taken to secure it, and that a reasonable time will be allowed to do the necessary work.

This is a point of great importance to mine operators. If action is not taken within a reasonable time to do the necessary work, the right relates to the time of completion and not to the beginning of it. It is at once apparent that rights may be lost entirely by the intervening appropriation of another, if the work is not pursued diligently and completed within a reasonable time. The California court has said that possession and acts of ownership are conclusive evidence of the right to use water on the part of the appropriator. The right to use water may also be acquired under the rule of adverse possession by continued, uninterrupted and adverse possession or enjoyment of the water during the period limited under the statute of limitations for entry upon the land.

In general, it may be said that the usual rules of priority apply in the case of appropriation of water. The appropriator who was first in point of time has a superior right over all others. But the right acquired does not extend to an exclusive right, except under peculiar circumstances.

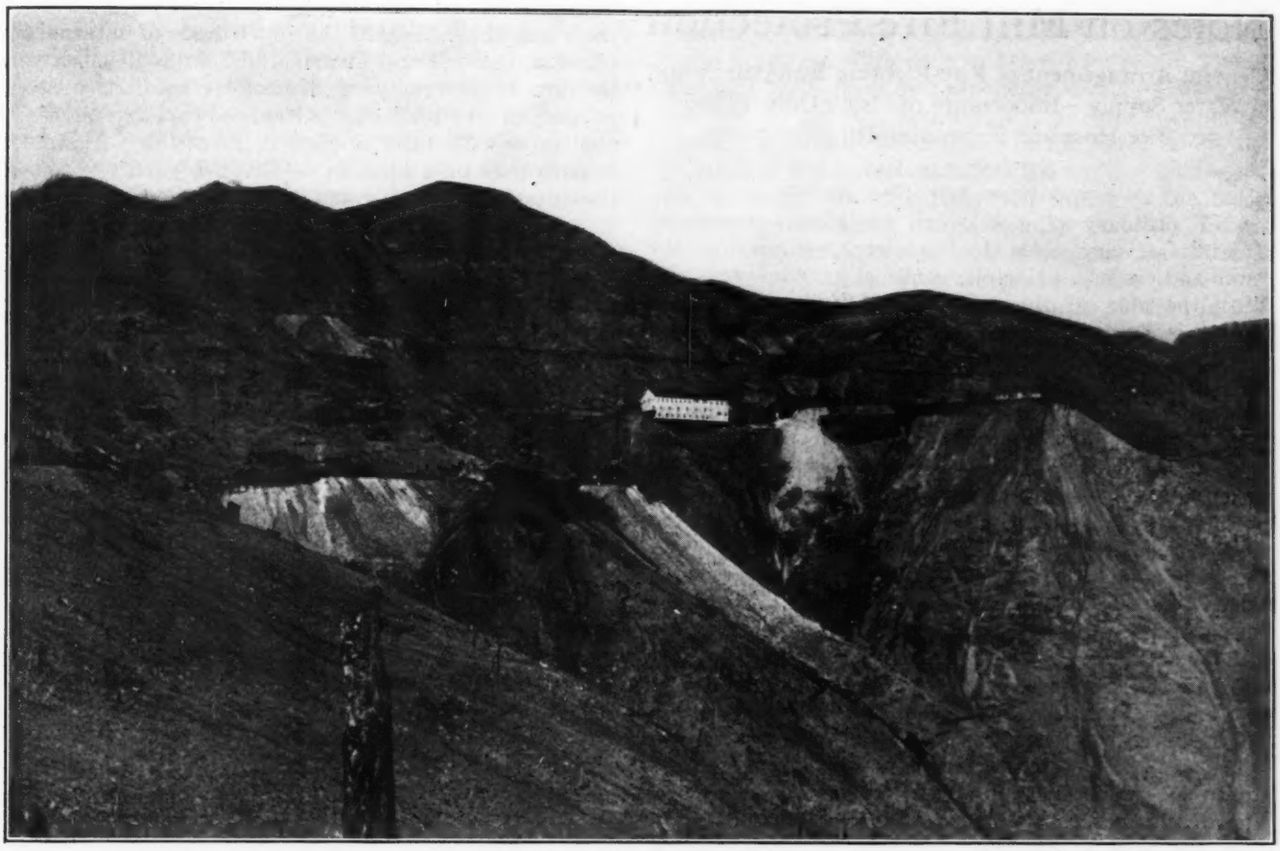
The rule is well recognized that the prior appropriator is entitled to water to the extent to which it was appropriated, to the exclusion of any subsequent appropriator for the same or any other use. This means that the appropriator acquires no greater right, by reason of his priority, than he exercised before subsequent appropriators came in. He cannot use half the volume of water and then decide to use it all after another appropriator begins to use some of the water. The rights acquired under appropriation are held to be as perfect and absolute as if they were acquired by prescription or by an express grant from a riparian owner. The extent of the appropriation and practically all questions arising under it have been held to be questions of fact to be determined solely by the decision of a jury, after all the evidence has been presented.

These principles form the settled rules as applied to the manner in which rights may be acquired for the use of water. They in no way apply to or affect instances where the land is already in the hands of individual owners, in which case the right to use is a matter of contract or of purchase.

Mills and Mines in California

FLOTATION PLANT OF THE AFTERTHOUGHT MINING CO., INGOT, SHASTA COUNTY, CAL.

ELECTROLYTIC ZINC PLANT, OF THE U. S. SMELTING, REFINING & MINING CO., KENNETT, SHASTA COUNTY, CAL.



THE MAMMOTH MINE, OF THE U. S. SMELTING, REFINING & MINING CO., KENNETT, SHASTA COUNTY, CAL.

LA GRANGE HYDRAULIC MINE, AT OREGON GULCH MOUNTAIN, TRINITY COUNTY, CAL.

The photograph was taken soon after the last sluicing had been done, and the mine is now closed. It will be noted that what is apparently a cleft is to be seen in the background. This is caused, however, by the gold-bearing gravel slipping down on the bedrock as the "giants" sluice it away.

Notes on Mill Fire Protection

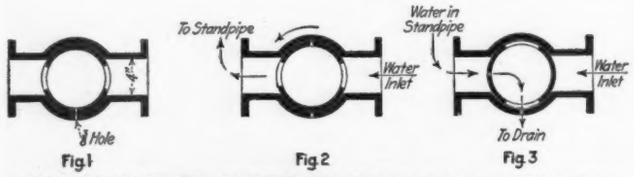
General Arrangement of Fire-Fighting Equipment and Water Supply—Importance of Using Only Standard Fire Hose and Expanding-Ring Couplings

BY DOUGLAS LAY
Mining Engineer, Hawarden, England

ANY ordinary plug-cock can be readily converted into a serviceable hydrant cock, employing the "stop-and-waste" principle, and at trivial expense. With the plug of the cock in the "full-on" position, a hole is drilled through body of cock, and through walls of plug, in a position central to both, as shown in Fig. 1. The size of hole will depend upon the size of the plug cock, a $\frac{3}{8}$-in. hole being about the right size for a 4-in. cock. The plug is now turned through 180°, when it will occupy the position shown in Fig. 2. This is the normal position of the converted cock, when delivering a full supply of water to hydrant. Turning the plug through 90° from this position, in the direction shown by circular arrow in Fig. 2, shuts off the water supply completely, and the water in the hydrant pipe is automatically drained through the ports drilled in the cock, thus giving a frost-proof hydrant.

Obviously, the travel of the plug must be confined to 90°, and the direction of rotation must be as indicated. This is readily effected by means of stops so placed that the plug cannot be turned the wrong way. These stops may be either small dowels placed in the body and plug of the cock, or the long tee handle attached to the plug may have at its upper end stops so placed that a turn in the wrong direction is impossible, and the travel is restricted to 90 degrees.

The general arrangement of a serviceable hydrant and hose house is shown in Fig. 4. The hydrant cock, above described, is buried about three feet below the surface of the ground, a wooden box being placed over the cock, to prevent soil from plugging the drainage port. Under and around the cock, coarse rock is packed to facilitate drainage. A long tee handle is rigidly attached to the plug, and extends upward, through a wooden box, through the floor of hydrant house. An indicator is placed over the top of the handle showing plainly the direction of rotation. This, of course, does not obviate the necessity of the stops previously referred to, but no hard thinking should be required in connection with fire appliances at a time of emergency.



CONVERSION OF ORDINARY PLUG STOP-COCK INTO HYDRANT COCK

Clamped to the standpipe is a swinging hose rack containing 50 ft. of 2½-in. standard fire hose, with nozzle attached, which is always coupled up and ready for instant use. Additional hose is hung on racks on the walls of the hydrant house. The 2½-in. gate valve shown gives additional control over the water supply. Such a yard hydrant should be at least 100 ft. distant from the nearest building.

Too little attention is frequently paid to the question of fire protection, in connection with mills. More often than not, the protection appliances are entirely within buildings, and yard hydrants are conspicuous by their absence. Granted the importance of internal appliances, there should invariably be, in addition, a yard hydrant or several yard hydrants placed at strategic points. A fire may gain such headway that access to appliances within the building is impossible. Again, the menace may be a bush fire. Given a yard hydrant on the outskirts of the group of buildings, and, say, 500 ft. of hose, the surrounding area may be so drenched that all danger from this source may be averted.

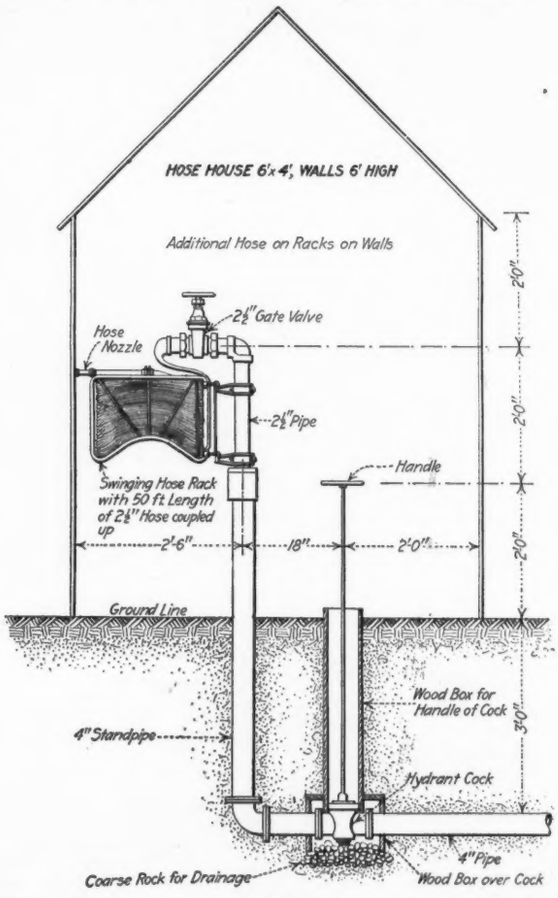


FIG. 4. GENERAL ARRANGEMENT OF YARD HYDRANT

No hose other than standard fire hose, with expanding-ring couplings, should be permitted in connection with fire-protection appliances. To employ any other kind of hose is to dwell in a fool's paradise. Hose couplings, other than expanding-ring couplings, are likely to come apart at a critical time, and render an abundant water supply of no avail.

Changes in Alaska Juneau Ball Mills

When the new Alaska Juneau mill began operating, in the spring of 1917, it was found that the ball mills would grind only a small fraction of what was expected. As the entire mill had been built on the assumption that the ball mills would operate at their rated capacity, the problem was a serious one. Considerable improvement was secured by reducing the size of the feed from 3 in. to 1½ in., but even then the capacity did not reach the desired figure.

According to the fourth annual report of the company, experiment has proved that a greater capacity and a reduced cost can be obtained by converting the ball mills into the closed-circuit, overflow type. The grinding

has heretofore been to approximately 10 mesh, the mill product passing through revolving screens, the oversize from which has been reground in tube mills. It has now been decided to remove the grates from the mills and also to grind all 10-mesh oversize in the ball mills themselves, thus dispensing with the tube mills entirely. For the purpose of returning this material, a bucket elevator is being installed for each two ball mills. During the transition to the new practice, however, the oversize from the overflow mills will be used for pebbles in the tube mills. It is hoped, by this change, to bring the mills more nearly up to the capacity for which the plant was designed.

A slight change has also been made in the flow sheet immediately preceding the ball mills. During 1917 the 50-stamp mill was used to grind the same class of ore that was handled by the ball mills, viz. about 1½ in. Now, however, short grizzlies have been installed for the purpose of splitting the gyratory crusher discharge into plus 2½-in. material for the stamp mills and minus 2½ in., or screenings, for the ball mills.

With these and other changes which have been announced, it is expected that the mill will be able to treat 8,000 tons of ore per day, at the same time rejecting an equal amount of waste.

New Method of Adding Water To Conical Mills

Larger Capacity and Reduction of Oversize Accomplished by the Use of a Water Spray in the Discharge Cone—Utility of Water Rheostat

IT IS THE present general practice in the operation of ball mills to add all of the water to the feed end of the mill. Experimentation and tests made by C. W. Dowsett, of the Bluestone Mining & Smelting Co., Yerington, Nev., have proved that, in his case, better results are secured in the Hardinge conical mill by adding a part of the water, or some additional water, just inside the discharge end of the mill. The assumption is that while the ore is coarse little or no water is required, excess water merely acting to break the fall of the balls and wash away the finer ore particles. As the ore passes to the discharge end of the cone, however, the surface area of the ore particles is considerably increased, so that the pulp becomes very thick. This prevents proper classification and results in large pieces of ore, ½ to ¾ inches in diameter, discharging with the finer material. The dilution of the water spray allows the proper classifying action in the discharge cone to take place.

Mr. Dowsett has inserted a 1½-in. water pipe in the discharge trunnion of his mill, fitted with a ¾-in. nozzle so directed that a spray impinges on the rising side of the pulp about 18 in. to 2 ft. inside of the mill. He has found that by shutting off this water spray for five minutes the amount of oversize is greatly increased.

While at the Dome, Mr. Dowsett also experimented with a water rheostat in connection with the motor used to drive the 8-ft. by 30-in. Hardinge mill at that plant, coming to the conclusion that a variable speed motor would possess certain advantages for a ball-mill drive. In these tests he found that with a slight variation in the hardness or size of the feed, a moderate increase or decrease in the speed of the mill, obtained by raising or lowering the plates of the water rheostat, was necessary to keep the capacity of the mill at a maximum. Sometimes a variation of ½ to ¼ of a revolution per minute made a marked difference in the capacity. In view of this fact, he believes that the motor should be sufficiently oversize to prevent line surging, as this surging will cause considerable fluctuations in the speed of the mill.

Another aid to greater capacity which Mr. Dowsett claims is the use of a restricted throat in the feeder, with large diameter trunnions. In this way he gets more of the action of a Frenier sand pump and an actual hydrostatic head to force the feed into the mill.

Whether or not better results can be secured in ordinary mill practice by the above suggestions can be easily tested. An ammeter may be placed in the power circuit, and the water may also be metered when the spray in the discharge is tried, in order to determine the best conditions of operation. Under certain conditions, a thickening of the coarse ore pulp will result in an increase of both the power required and the grinding efficiency. If the pulp becomes too thick, more power is required but less grinding will be done, so that it devolves upon the operator to secure a critical medium.

Mine Labor Wages in Alsace-Lorraine*

There has been a noticeable increase in the average earnings of miners in the coal, iron and potash mines of Alsace-Lorraine, according to the *Bulletin du Ministère du Travail et de la Prévoyance Sociate.* The following table shows the number employed, shifts worked, and the average wages for specified periods, 1913 to 1918.

INDUSTRIAL DATA, ALSACE-LORRAINE MINES, 1913-1918

Period	No. of Persons Employed	No. Shifts Worked	Earnings: All Employees	Earnings: Per Shift	Earnings: Per Quarter per Employee	Earnings: Per Shift per Miner
Coal mines						
1913	16,333	(a)	(a)	$1.07	(a)	$1.27
1914, second quarter	15,445	79	$1,329,577	1.09	$86.08	1.30
1914, third quarter	9,512	76	752,700	1.03	78.17	1.24
1918, first quarter	11,229	85	1,816,709	1.88	161.93	2.48
Iron mines						
1913	16,975	(a)	(a)	1.41	(a)	1.60
1914, second quarter	14,939	74	1,534,350	1.37	102.87	1.59
1914, third quarter	8,307	63	691,519	1.32	83.38	1.54
1918, first quarter	8,581	77	1,373,388	2.09	160.00	2.85
Potash mines						
1913	1,175	(a)	(a)	1.06	(a)	1.19
1914, second quarter	1,879	74	143,206	1.03	76.24	1.15
1914, third quarter	692	75	52,496	1.04	76.04	1.14
1918, first quarter	1,060	78	130,468	1.57	122.94	2.12

(a) Not reported.

Quicksilver Orebodies, as is well known, are usually per quarter in 1918 compared with the nearest corresponding period of 1914 was 88.1 per cent in coal mines, 55.5 in iron mines, and 61.3 per cent in potash mines.

Quicksilver Orbodies, as is well known, are usually irregular in form, and probably for no other group of metalliferous deposits is prediction or quantitative estimation more difficult. By far the greater number of quicksilver orebodies that have been or are being worked in the United States, according to F. L. Ransome in *Bull.* 666-FF, U. S. Geological Survey, are irregular lenses, pipes, or podlike masses with few or no definite surfaces of demarcation separating them from the inclosing rocks. Where several orebodies occur, they are usually arranged along a principal zone of fissuring, and may have one distinct wall, generally marked by a seam of claylike material, or gouge, produced by the crushing and grinding of the rock along one of the fissures. The ore masses may consist of porous rock through which the cinnabar or other quicksilver minerals are scattered in small crystal particles, or may be made up of rock that is traversed by many irregular veinlets or stringers, in which occur most of the valuable minerals.

*Extracted from *Monthly Labor Review,* June, 1919.

Mexico's New Mining Law

Decree Brings Together in One Measure All Mining-Tax Legislation—Property-Tax Rates The Same as Previously Levied—Owner Must Pay, Irrespective of Possession—Text of New Law Translated

WASHINGTON CORRESPONDENCE

BEFORE considering the substances of the New Mexican mining law, just enacted, two general observations are in order as to form. In the first place, the decree is issued under the blanket resolution of May 8, 1917, conferring upon the executive "extraordinary powers in the Department of Finance." The sole justification, if any there be, for this method of "legislating" lies in the abnormal conditions prevailing just after the Constitutionalist revolution triumphed. To continue to use this power after more than two years of a return to constitutional order denotes a complete overshadowing of the legislative branch of the government by the executive. In a word, it seems to be time to call a halt to "legislation by executive decrees." Secondly, the law is drafted in more legal language than has been the case recently. This clearly shows the hand of Cabrera.

The most important changes that have been introduced are as follows:

1. The decree in question brings together into a single measure the different mining tax decrees.

2. The property-tax rates (Art. 3) do not differ in any particular from those prescribed in the decree of Apr. 26, 1918. In this connection it should be noted that the heavier rates applied to larger properties will tend to discourage large mining holdings. Though there can be little question as to the benefit of the partition of large landed estates from the agricultural point of view, the expediency of discouraging large mining properties is certainly open to grave doubt, particularly where ores are low grade.

3. Art. 6 makes payment of the property tax compulsory, irrespective of possession by the owner.

4. In the matter of the production tax, the changes are few. They are as follows:

(a) With the exception of copper, the rates are the same as those prescribed in the decree of Apr. 26, 1918, with a reduction from 3 per cent to 2 per cent in the case of lead, tungsten, molybdenum, graphite, and mercury (Art. 7-D).

(b) A sliding scale, adjusted according to the New York quotations, from 60 per 1,000 when the price is 25c. or over to 1 per 1,000 when the price is under 10c., is provided for copper.

5. The mint is bound to receive only gold from individuals for coinage. The former decree (Apr. 26, 1918, Art. 2) provided for the coinage of gold, in unlimited amounts, and of silver, under special permission from the Department of Finance.

6. Facilities are offered to owners whose mining-tax payments are in arrears. These may be paid in the same number of installments as the number of periods of four months (*tercios*) that are owed. This privilege expires Sept. 30, 1919.

7. The obligation to re-import an equivalent amount of gold for all gold exported is left effective under the present law only as long as restrictions as to free circulation of gold are in force in other countries.

The previous decree (Apr. 26, 1918) required in the case of silver that 50 per cent of the value thereof be re-imported in gold. This was later modified to 25 per cent in gold and 25 per cent in subsidiary coinage. The present decree abolishes this requirement entirely.

The complete text of the new statute, as translated, is reproduced as follows, without modification.

MINING TAX LAW

Issued under the extraordinary powers in the Department of Finance granted the executive by the resolution of Congress of May 8, 1917.

CHAPTER 1
ON THE TAX IN GENERAL

Art. 1. The mining industry shall pay the following taxes: A, property tax; B, production tax; C, smelter, coinage and assay dues.

CHAPTER 2
ON THE PROPERTY TAX

Art. 2. Mining patents (*titulos*) shall pay, at the time of issuance, a tax of ten pesos for each hectare covered by the patent, irrespective of the mineral substances whose development is authorized. This tax shall be payable in stamps affixed to the patent.

Art. 3. All mining properties shall pay an annual tax, according to the following rates:

A. Properties of one to five claims (*pertenencias*) at the rate of six pesos per claim, per annum; that is to say, two pesos payable every four months.

B. Properties of six to fifty claims at the rate of nine pesos per claim per annum; that is to say, three pesos payable every four months.

C. Properties of fifty-one to one hundred claims at the rate of twelve pesos per claim per annum; that is to say, four pesos payable every four months.

D. Properties of one hundred and one claims and upward at the rate of eighteen pesos per claim per annum; that is to say, six pesos payable every four months.

Art. 4. The progressive rates shall be applicable, provided the claims belong to a single owner and are located within the jurisdiction of the same mining agency.

Art. 5. The tax on mining claims shall be paid every four months in advance. Failure to make any payment when due shall work a forfeiture of the mining property, which shall be declared in accordance with the regulations on the subject.

Art. 6. The property tax shall be payable so long as the patent is in force, whether the property be developed or not, or whether or not effective possession of the property be had by the owner thereof.

CHAPTER 3
ON THE PRODUCTION TAX

Art. 7. Gold, silver, and industrial metals, whether produced within the republic or proceeding from abroad, shall be subject to a tax, according to the following schedule:

A. At the rate of 7 per cent on the value of the gold and silver presented to the mint for coinage.

B. At the rate of 8 per cent on the value of gold and silver for export purposes, when in the form of mineral rock or earth, concentrates, cyanides, or sulphides, smelter tailings, or in any other form in which the metals are com-

bined or blended with substances that are not metals, properly speaking.

C. At the rate of 7 per cent on the value of gold and silver for export purposes, provided they have been treated in the country to such a point as no longer to contain a mixture of other metals, irrespective of the fineness of the product.

D. At the rate of 2 per cent on the value of lead, tungsten, molybdenum, manganese, graphite, and mercury.

E. At the rate of 1 per cent on the value of zinc, antimony, and other metals and minerals not otherwise provided for in this article.

F. At the rates specified below on the value of copper for export purposes when presented in bars, bullion or concentrates, provided these substances contain more than 50 per cent copper and more than 300 grams silver or 5 grams gold per ton:

At the rate of 60 per 1,000 when the value of electrolytic copper, per lb., is 0.25c. U. S. currency or over in New York;

At the rate of 50 per 1,000 when the quotation is from 0.20c. to 0.25c. U. S. currency;

At the rate of 40 per 1,000 when the quotation is from 0.19c. to 0.20c. U. S. currency;

At the rate of 35 per 1,000 when the quotation is from 0.18c. to 0.19c. U. S. currency;

At the rate of 30 per 1,000 when the quotation is from 0.17c. to 0.18c. U. S. currency;

At the rate of 25 per 1,000 when the quotation is from 0.16c. to 0.17c. U. S. currency;

At the rate of 20 per 1,000 when the quotation is from 0.15c. to 0.16c. U. S. currency;

At the rate of 10 per 1,000 when the quotation is from 0.13c. to 0.15c. U. S. currency;

At the rate of 5 per 1,000 when the quotation is from 0.10c. to 0.13c. U. S. currency;

At the rate of 1 per 1,000 when the quotation is from 0 to 0.10c. U. S. currency.

G. At the rates specified below on the value of copper for export purposes when presented in bars, bullion, or concentrates, provided these products contain a fineness of more than 50 per cent copper, but of less than 300 grams silver or of 5 grams gold per ton:

At the rate of 60 per 1,000 when the value of electrolytic copper, per lb., is 0.25c. U. S. currency or over in New York;

At the rate of 30 per 1,000 when the quotation is from 0.20c. to 0.25c. U. S. currency;

At the rate of 25 per 1,000 when the quotation is from 0.19c. to 0.20c. U. S. currency;

At the rate of 20 per 1,000 when the quotation is from 0.18c. to 0.19c. U. S. currency;

At the rate of 18 per 1,000 when the quotation is from 0.17c. to 0.18c. U. S. currency;

At the rate of 15 per 1,000 when the quotation is from 0.16c. to 0.17c. U. S. currency;

At the rate of 13 per 1,000 when the quotation is from 0.15c. to 0.16c. U. S. currency;

At the rate of 10 per 1,000 when the quotation is from 0.13c. to 0.15c. U. S. currency;

At the rate of 5 per 1,000 when the quotation is from 0.10c. to 0.13c. U. S. currency;

At the rate of 1 per 1,000 when the quotation is from 0 to 0.10c. U. S. currency.

H. At the rates specified below on the value of copper for export purposes when presented in the form of natural ores or concentrates of a fineness of not over 50 per cent copper:

At the rate of 80 per 1,000 when the value of electrolytic copper, per lb., is 0.25c. U. S. currency or over in New York;

At the rate of 70 per 1,000 when the quotation is from 0.20c. to 0.25c. U. S. currency;

At the rate of 60 per 1,000 when the quotation is from 0.19c. to 0.20c. U. S. currency;

At the rate of 50 per 1,000 when the quotation is from 0.18c. to 0.19c. U. S. currency;

At the rate of 40 per 1,000 when the quotation is from 0.17c. to 0.18c. U. S. currency;

At the rate of 30 per 1,000 when the quotation is from 0.16c. to 0.17c. U. S. currency;

At the rate of 25 per 1,000 when the quotation is from 0.15c. to 0.16c. U. S. currency;

At the rate of 15 per 1,000 when the quotation is from 0.13c. to 0.15c. U. S. currency;

At the rate of 5 per 1,000 when the quotation is from 0.10c. to 0.13c. U. S. currency;

At the rate of 1 per 1,000 when the quotation is from 0 to 0.10c. U. S. currency.

Art. 8. The mint shall receive from individuals gold for coinage without any limitation as to amount at the rate of 1,333.13 pesos per kg. of pure gold; the same rate shall apply for the production tax and the coinage dues.

Art. 9. The right to mint silver coins pertains exclusively to the federal government, the right of individuals to send this metal to the mint for coinage hereby ceasing.

Art. 10. For the collection of the production tax on silver and industrial metals, the Department of Finance shall issue every month a schedule of rates applicable to the following month, taking as a basis the average of the prices prevailing in the two preceding months for metals and metallurgical products or for natural ores in New York, according to the special circumstances in each case.

Art. 11. In all such cases the rates prevailing on the day of the presentation of the metals to the mint, to federal assay offices or to the custom houses shall apply.

Art. 12. The production tax shall not be paid by:

A. Old Mexican and foreign gold coins presented to the mint for re-coinage; these shall only pay coinage assay, or smelter dues, as the case may be;

B. Gold, silver, copper, lead or zinc, when exported in the form of mineral stone, earth, or dust, whether in the form of sulphides, cyanides, or smelter tailings, provided these substances do not contain the following metals in these proportions: Gold, 2 grams per ton; silver, 250 grams per ton; copper, 3 per cent; lead, 8 per cent; zinc. 15 per cent.

C. Gold, silver, copper, lead, or zinc which, after having been imported into the republic in the form of mineral stone, earth or dust, or scientifically [metallurgically?] treated, are exported within the next four months in a metallic state, after having undergone metallurgical treatment in smelters or other like establishments existing in the country; provided the substances imported have a fineness greater than those specified in the foregoing section (B). The interested parties shall pay the assay dues and inspection charges on such minerals.

D. All metals used in the national industries. In order that gold and silver may be included in this privilege, the interested parties must prove to the satisfaction of the mint, or the federal assay office, that those metals have been put to industrial uses.

E. Samples of minerals exported in their natural state whose weight does not exceed 10 kilograms and whose intrinsic value is not over 10 pesos.

F. Iron ores.

Art. 13. Smelter, coinage and assay dues shall be paid according to the schedules of rates issued by the Department of Finance, or the basis of the cost of the respective operations.

Art. 14. Assay dues shall be paid whenever this operation is carried out by mandate of law, by administrative ruling, or at the request of the interested parties; smelter dues shall be paid when, because of the lack of uniform character of the bars or pieces, it becomes necessary to melt them for assay or coinage purposes; coinage dues shall be paid whenever the metals are coined.

Art. 15. Assay dues shall not be paid when, after the operation has been carried out by mandate of law or by administrative ruling, it is shown that there are only vestiges or traces of metals sought in the products assayed.

CHAPTER 4

ON GENERAL PROVISIONS

Art. 16. The states shall not levy on mining property,

or on the development or output of mines, more than a single tax, which tax shall not exceed 2 per cent of the value of the metal, in the case of gold or silver; nor of 50 per cent of the production tax hereby levied on other metals or minerals. States are accordingly expressly forbidden to levy any other tax, irrespective of its name, on the extraction, output, profit, or utility of mines, of smelters or metallurgical establishments of any kind, including coke factories, on the capital invested therein, or shares and mining stocks, on the transfer of ownership of mining properties or of metallurgical establishments, as well as on entries (*denuncios*), possession, constitution of mining or smelting companies, issuance of certificates or shares or on any operation relating thereto, and in general on all proceedings necessary to the establishment, acquisition, or development of mining or metallurgical properties.

Art. 17. Smelters and other metallurgical establishments of every kind, including coke factories, shall pay to the state government in which they are located, or to the governments of the federal district and territories, as the case may be, a single tax which shall not exceed (?) per 1,000 per annum on the value of the property and its equipment.

Art. 18. The federal tax shall not be paid on taxes paid under the laws and provisions enacted by the state governments within the limits presented in the foregoing articles.

Art. 19. The municipalities shall in no event levy any tax on mining, under any name or designation.

Art. 20. The export of gold ready for mining and of any kind of gold or silver coin of the Mexican currency system, as well as all kinds of foreign gold coins, is hereby prohibited, under penalty of seizure.

The Department of Finance may permit the export of solid silver pesos, provided that within a term of five days there be imported into the country for coinage by the mint an amount of gold equal to the value of the pesos exported.

Art. 21. The importation of Mexican and foreign gold coins is hereby exempted from the payment of consular dues, as well as from the requirement of a consular invoice.

Art 22. No import duties shall be paid by the following substances provided they are introduced into the country to be used in the treatment of minerals: Zinc and aluminum in bars, fillings, etc. . . . ; sulphur; alkaline cyanides; hyposulphite of soda; lead acetate; and zinc in small perforated sheets.

TRANSITORY ARTICLES

Art. 1. This law shall go into effect from July 1 next (1919).

Art. 2. The decree of Apr. 26, 1918, and all former laws and provisions on mining taxes and privileges are hereby repealed.

Art. 3. All fines owed by reason of the annual tax on mining properties, including those due up to the date of the promulgation of this decree, are hereby canceled.

Art. 4. Persons liable to the tax on mining claims are hereby allowed the months of July and August in which to pay, without surcharge, the taxes due in the first and second periods of four months each of the present year.

Art. 5. Owners of mines that may be owing taxes prior to 1919 and who shall have paid the first two periods of the present year, as prescribed in the foregoing article, shall have the right to pay their arrears in as many installments as the number of periods of four months they are owing, amortizing the amount of one period of arrears each time they make payment of their regular taxes.

Art. 6. The patents of those persons who fail to take advantage of this privilege, or those who being entitled thereto do not make their payments on the dates of maturity, shall be declared forfeited, as provided by law, and such persons shall not have the right to resort to any other recourse.

Art. 7. Those persons who take advantage of the privilege allowed in Art. 5 (transitory) shall be required to file with the Department of Finance a statement (*manifestation*) containing the following data: Office where payment is made, number and date of patent, name of the property, name of the present owner, amount of the arrears, and receipt of the payment of the two periods of the present year. The term within which advantage may be taken of the privilege granted under Art. 5 (transitory) will end Sept. 30, 1919.

Art. 8. Mining-property taxes and production taxes that may be owing on the date when the present law goes into effect shall be liquidated and paid according to the rates provided in the decree of Apr. 26, 1918, which is hereby repealed.

Art. 9. So long as the international restrictions on the free circulation of gold continue in force, exporters of mixed bars of gold minerals and concentrates of any kind, provided they have a fineness of gold greater than two grams per ton, shall re-import in gold bars ready for minting or in Mexican foreign gold coins an amount equivalent to the amount of gold contained in the bars, minerals, or concentrates exported.

Art. 10. The Department of Finance shall determine the procedure to be followed in guaranteeing the re-importation of gold to which the foregoing article refers.

Art. 11. Gold re-imported under the foregoing articles shall not be subject to the production tax, since the metal on being exported will have paid the said tax.

MEXICO CITY, JUNE 27, 1919.

Permanent Exhibit of Mining Machinery Planned

Will Occupy One Entire Floor of Grand Central Palace, New York—Coal and Oil Industry Included

A PERMANENT exhibit of all the latest and best machinery and supplies used in the mining and metallurgical industry is to occupy 50,000 sq.ft. of floor space in the Grand Central Palace, 46th St. and Lexington Ave., New York City. This announcement, recently made, will be of great interest to all mining men. Heretofore long and costly trips have often been necessary to compare the merits of the various machines used in the industry and actually to see the appliances which are used in the most up-to-date practice. Also, familiarity with the implements of one industry often leads to an appreciation of their applicability to another. Some of the standard machinery at present used in the milling of copper ores, for example, is borrowed from the gold and silver industry.

The International Exhibition of Mining Industries is only one part of the project, as the remaining floors of the building will be devoted to other kinds of business. The whole idea is fathered by the Nemours Trading Corporation, of which Alfred I. du Pont is president. It is represented in all of the leading cities of the world, with 19 branch offices and 3,000 foreign selling agencies, all of which will spread knowledge of the Grand Central Palace exhibits.

The exposition of mining industries will include the machinery and supplies used in the development and exploitation of metal and non-metal mines, coal mines and oil wells; the subsequent extraction, reduction, or refining of the raw products by concentration, leaching, cyanidation, flotation, smelting, distillation, and coking, and the handling and marketing of the products. Howard R. Ward, who will manage the project, is a mining engineer. He has practiced in the West for fifteen years and was for three years consulting mining engineer with the American International Corporation, where he was associated with the organization of its machinery export companies.

It is planned to have the exhibit open by Oct. 15, and remain open, as a permanent, continuous exposition.

Business Training for the Engineer*

Importance of Mastering Fundamental Commercial Principles—Results of Present Curricula Unsatisfactory—Suggestions Respecting Essential Technical Preparation and the Means of Acquiring a Broader Professional Equipment

BY ANSON MARSTON
Dean of Division of Engineering, Iowa State College, Ames, Iowa

I BELIEVE that the demand for business training for the engineer is widespread throughout the engineering profession. In part, it is a more or less unconscious revolt against the conception so common in the business world, that the engineer is merely a highly skilled mechanic, destined by fate and custom to serve only as an employee of some profit seeker. In 1907 the first precautionary measure taken by capitalists when the financial storm burst was to drop most of their engineers from the payrolls. Within a week the character of the letters reaching my desk changed from appeals by corporations for more engineers at any price, however high, to appeals by engineers for employment at any price, however low. Alumni who had just resigned permanent positions held for years to accept enticing offers found those offers repudiated while they were en route to their new stations. Moreover, our railways for a generation before the war met each new legislative restriction on rates by small economies, such as in lead pencils and in engineers.

The new thought is, why should not the engineer be his own employer in great industrial enterprises of an essentially engineering character? Why should he not be the organizer, the president, the manager of great industrial corporations rather than a mere hired expert?

PRESENT METHODS GIVING POOR RESULTS

Another cause for the present demand for business training for the engineer is the general dissatisfaction among employers of engineers with the product of our engineering courses of study. Methods of instruction have become standardized to such an extent that it is almost as great a sacrilege for any engineering college to deviate from the general practice as it was for the ancient Egyptian draftsman to vary a line from the orthodox in representing Pharaoh. Of engineering educators it truly may be said that we have looked upon our work and we find that it is good, but we have no inquisition at our command to put down the numerous latter-day heretics who keep on pointing out defects in the results we secure.

The engineer employer needs, above all, men who are qualified for successful executive responsibilities in great industrial undertakings, and he is not satisfied with the product which our engineering colleges are sending out.

Even before the war, then, engineers and engineer employers were demanding business training for the engineer. Since the close of the war comes Uncle Sam himself to tell us that the imperative post-war needs of the United States require great engineer leaders, with sound business training, to develop our great mechanic arts, industries for economic and profitable production, transportation, sale and use, at home and abroad. Patriotic duty to the country now furnishes an additional reason for the introduction of business training into every engineering course as a fundamental part thereof.

BUSINESS TRAINING AN ADDED QUALIFICATION

I would call attention at this point to the fact that the subject of this paper is "Business Training for the Engineer," not "Engineering Training for the Business Man." The two topics should not be confused.

The schools of commerce are coming to call upon the colleges of engineering for some informational training of commerce students along engineering lines. This call should be heeded, but it is not believed that the great mechanic arts and trade needs of the country can be met adequately by superficial descriptive engineering training of business men to such extent only as to enable them to read with fairly intelligent understanding the reports of hired engineer experts. What we need are great engineer leaders, men who possess the highest engineering qualifications combined with great business ability, and who can conceive great mechanic arts, enterprises, design their engineering details, build their greatest constructions, organize and direct their operations, and who also can interest capital and deliver a fair profit to investors.

I take it that the principal object of all business training (speaking frankly) is financial profit. Public utilities, for example, are successful from the business point of view whenever they make money for their stockholders, although they may poison a city with polluted water, furnish unsatisfactory light and power, cause the traveling public all sorts of inconvenience, or ruin industries by insufficient or inequitable transportation facilities. Toleration of such shortcomings, it is true, might be unwise, but this would be because they might arouse antagonism, cause enaction of legal restrictions, decrease patronage, or otherwise operate to decrease profits.

PROFIT IN ENGINEERING ONLY ONE ESSENTIAL

In engineering, on the other hand, profit, though essential, is only one essential to be attained, and achievement in the successful utilization of the principles of the science of mechanics is the great object. The engineer has been trained to give primary attention to the scientific principles of design, to ingenuity in invention, to industrial organization for construction and production on the greatest scale and at the lowest cost.

In planning business training for the engineer we should not attempt to lower the great ideals of his

*Excerpted from an address delivered at the conference on "Business Training for Engineers and Engineering Training for Students of Business," Iowa State College, June 23, 1919.

profession. We should add business training to the engineer's equipment, not substitute it for engineering qualifications. We should qualify the engineer to take into account, with due weight in the solutions of his problems, the great questions of capital, labor, and profits as well as the scientific principles of engineering theory and experience. The engineer's remuneration should no longer be left to be considered as a mere item on the cost side of the books of the enterprise.

How to Provide Such Business Training

There are those who believe that the problem of how to provide business training for the engineer can be solved best by creating a new branch of engineering to be called "Business Engineering," providing four-year business-engineering courses supplementary to the course in civil, mechanical, and electrical engineering. Some schools of commerce, on the other hand, offer four-year business courses in which a certain amount of engineering training is included in addition to their commerce courses.

Though not denying that they may serve useful purposes at some institutions, I do not believe that four-year combined courses of either type furnish an adequate solution of the general problem of business training for the engineer. Manifestly, only a small fraction of the engineering students, on the one hand, and the commerce students, on the other, can be expected to enroll in such courses. We already have too many special courses in engineering. The present tendency is toward broader rather than more specialized engineering training.

The only really adequate method for providing the business training now needed by engineers is to put it into the regular four-year courses, as required work, to approximately the same extent as chemistry or physics. I earnestly believe that this should be done.

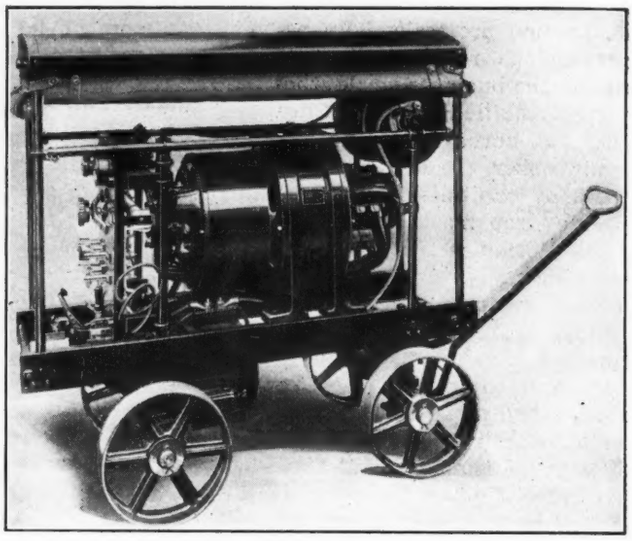
The business subjects should be restricted to simple, fundamental business principles. Economic science, accountancy, business law, corporation finance, industrial organization, and business psychology are examples. These subjects may be taught wholly in the school of commerce or partly in the college of engineering, according to local conditions. If taught in the school of commerce, turning this instruction over to subordinates should not be tolerated.

Electric Arc Welder for Portable And Stationary Use

Mounted on a Truck It Weighs 1,500 Pounds and Is Suitable for Use Where Work Cannot Be Brought Within 75 Feet of Apparatus

AN INVESTIGATION into the requirements of machine shops, railroads and shipyards has developed a line of electric arc welding machinery to meet the demands of various kinds of work. For use at shops where it is practicable to bring the parts to be welded to within 50 or 75 ft. of the welding apparatus, a stationary type is provided; also a lightweight portable machine is made which may be taken direct to the work.

With a rated capacity of 4 kw. the arc welder gives 200 amperes, direct current, or less, with an arc voltage of 17 to 22 volts and open-circuit voltage of 35 to 65. It is made in the form of a converter for use on 100 to 125 volts d.c. circuits only, and in the form of a motor-generator for all other a.c. and d.c. circuits. Weighing 665 lb., the converter delivers current at the arc through the arc stabilizing reactor with an efficiency of 65 to 70 per cent. The motor-generator type consists of a 7½ hp. a.c. or d.c. motor on the same shaft with a 4 kw. welding generator. This type is inherently regulated, compound wound, self-excited, and with dropping voltage characteristic. Practically constant energy is produced in the arc and response is claimed to be instant when the electrode touches the work.



TRUCK USED FOR PORTABLE ARC WELDER

For portable use a truck equipped with motor-generator or converter, panel, reactor, cover and cable reel is supplied. The truck, which is 28 in. wide, 55 in. high over cover and 54 in. long, weighs with complete equipment about 1,500 lb. These welders are manufactured by the U. S. Light & Heat Corporation, of Niagara Falls, N. Y., and a catalog describing the USL electric arc welding machinery is available for distribution.

Mining in South Dakota and Wyoming

The Black Hills mining district of South Dakota produced $6,565,209 in gold and 159,246 oz. of silver in 1918, according to the U. S. Geological Survey. From Jan. 1, 1918, to Oct. 27, 1918, the Homestake mine and mills were operated at full capacity, but during the rest of the year at only 71 per cent capacity. This property, which produces the bulk of the output of South Dakota, had not reached full capacity in June, 1919. The Golden Reward mines and mill, closed in 1918, have not resumed operations. The Trojan and the Mogul mills have both been operated in 1919. The production for the state in 1919 will apparently not equal the production in 1918.

Mines in Wyoming produced 7 oz. of gold, 253 oz. of silver, and 754,324 lb. of copper in 1918. The shipments of silver-copper ore from the Sunrise mine, near Hartville, the principal producing mine in Wyoming for several years, have not been continuous in 1919. A mill has been built to treat the dump ores of the old Ferris-Haggerty mines (long idle) at Encampment. The Rambler copper-platinum mine at Holmes has been idle in 1919.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Suspension of Assessment Work

No suspension of annual assessment work on mining claims is to be granted to any one claimant for more than five claims, according to a resolution of Representative Hawley, of Oregon, which will be reported favorably by the House Committee on Mines and Mining. Mr. Hawley's resolution originally did not contain the limitation, but after extensive hearings the committee made the amendment referred to and also struck out the provision that the resolution is not to apply to oil placer claims.

The original resolution provided for the suspension of annual assessment work during 1919, as had been granted unanimously by Congress for the years 1917 and 1918. This called forth energetic opposition from Representative Taylor, of Colorado, who insisted that stagnation in prospecting is resulting from the suspension of assessment work. He attempted to show that there no longer is reason why it should be extended. He offered no objections to the exemption of two or three claims and is fairly well satisfied with the five-claim exemption, which the committee agreed upon.

Several members of Congress, and J. F. Callbreath, secretary of the American Mining Congress, and H. N. Laurie spoke in favor of the resolution. The main argument was that the scarcity of labor would interfere seriously with going operations if a large number of men were drawn out of the industry to perform assessment work. It also was argued that under existing conditions, and with present prices, an injustice would be done the holders of claims. Mr. Laurie emphasized the serious consequences that would come to the holders of chrome claims if they were obliged to do their assessment work. He also pointed to the world's need in keeping up gold production, which, even now, is being handicapped by lack of labor.

War-Minerals Work Proceeds Slowly

Complaints are being received to the effect that settlement of war-minerals claims is being prolonged unduly. Some point to the fact that the War Department already has completed its settlement of informal contracts. The cases are not comparable. Direct contact had been made between War Department officials and those with whom informal contracts had been negotiated. The only matters remaining unsettled were formalities. In the case of the war minerals, there had been no understanding as to the purchase of a definite amount of ore or the prices which were to be paid. In all but a few cases, the Government was not consulted as to the wisdom of investments. The War-Minerals Relief Act provides restrictions which require a careful examination of each claim. As 1,200 complicated and intricate claims have had to be examined and an opportunity offered for the claimants to be heard in person, it can be seen that considerable time is necessary.

Every effort is being made to speed up procedure in the handling of claims. A year has been set as the extreme limit for disposing of the entire work of the commission. The task of that body has been made somewhat lighter as the result of the opinion of the Attorney General. It will eliminate a considerable portion of the claims from any consideration whatever.

An analysis of claims made by the American Mining Congress, which covers about 95 per cent of all claims filed, is as follows:

Alabama: 4 manganese, $100,225.26; 4 pyrites, $253,445.80; total, $353,671.06. Alaska: 1 chrome, $54,855.67. Arizona: 27 manganese, $239,785.90; 8 tungsten, $53,188.38; total, $292,974.28. Arkansas: 100 manganese, $1,017,855.52. California: 397 chrome, $1,692,646.20; 94 manganese, $523,747.54; 1 pyrites, $6,894.34; 22 tungsten, $710,963.57; total, $2,934,251.65. Colorado: 65 tungsten, $607,065.35; 21 manganese, $129,962.79; 1 chrome, $38,859.18; 7 pyrites, $671,595.40; total, $1,447,482.72. Delaware: 1 chrome, $20,000. Georgia: 17 manganese, $315,055.60; 11 pyrites, $1,478,065.84; total, $1,793,121.44. Idaho: 2 manganese, $19,909.50; 1 pyrites, $3,638.75; total, $23,548.25. Kentucky: 1 chrome, $19,597.89. Maryland: 1 chrome, $55,049.04. Missouri: 1 pyrites, $14,689.66. Montana: 35 manganese, $426,273.53; 6 chrome, $48,639.35; 3 pyrites, $6,800; 1 tungsten, $2,950.84; total, $484,663.72. Minnesota: 10 manganese, $1,417,629.42. New Mexico: 12 manganese, $178,746.71. New York: 1 pyrites, $500. Nevada: 32 tungsten, $312,824.56; 24 manganese, $140,892.56; total, $453,717.12. North Carolina: 5 chrome, $54,766; 4 manganese, $2,540.34. Ohio: 1 pyrites, $203,302.42. Oregon: 95 chrome, $426,310.09; 16 manganese, $276,591.72. Pennsylvania: 4 chrome, $84,233.51; 2 tungsten, $24,070.51; 1 manganese, $482.40. South Dakota: 1 manganese, $1,281; 1 tungsten, $1,000. South Carolina: 2 manganese, $22,697; 1 pyrites, $114,011.07. Tennessee: 34 manganese, $287,467.90; 1 pyrites, $1,660.38. Texas: 2 manganese, $6,377. Utah: 13 manganese, $88,701.18; 3 tungsten, $8,435.64; 1 pyrites, $2,186.50; total, $99,323.32. Virginia: 34 manganese, $1,875,109.84; 3 pyrites, $7,586.88; total, $1,882,696.72. Vermont: 1 manganese, $3,342.59. Washington: 5 chrome, $22,948.45; 2 manganese, $36,000; total, $58,948.45. Wyoming: 2 manganese, $38,828.60; 1 chrome, $38,858.18; total, $77,687.78.

There are claims from American producers operating outside of the United States as follows: Cuba: 4 manganese, $765,983.70; 1 chrome, $25,902.53; total, $791,886.23. British Columbia: 2 manganese, $22,736.32; 1 chrome, $11,604.21; total, $34,340.53. Mexico: 1 manganese, $7,931.67. Total foreign claims, $834,158.43.

All war relief claims may also be divided as follows according to the mineral involved: Pyrites, $2,764,377.04; manganese, $7,946,155.59; chrome, $2,594,271.30; tungsten, $1,720,498.85.

Freight Rates on Ore Shipments

The practice of stating rates on iron ore in short tons, instead of long tons, has been held by the Interstate Commerce Commission not to be unreasonable or otherwise unlawful.

Application has been made to the commission for permission to cancel rates on ore and bullion, in carloads, from Butte, Mont., to Greenwood and Trail, B. C., and on ore and concentrates from Butte and Anaconda to Salida, Col. The reason given is that no shipments are made under these rates.

Bureau of Mines Reorganized

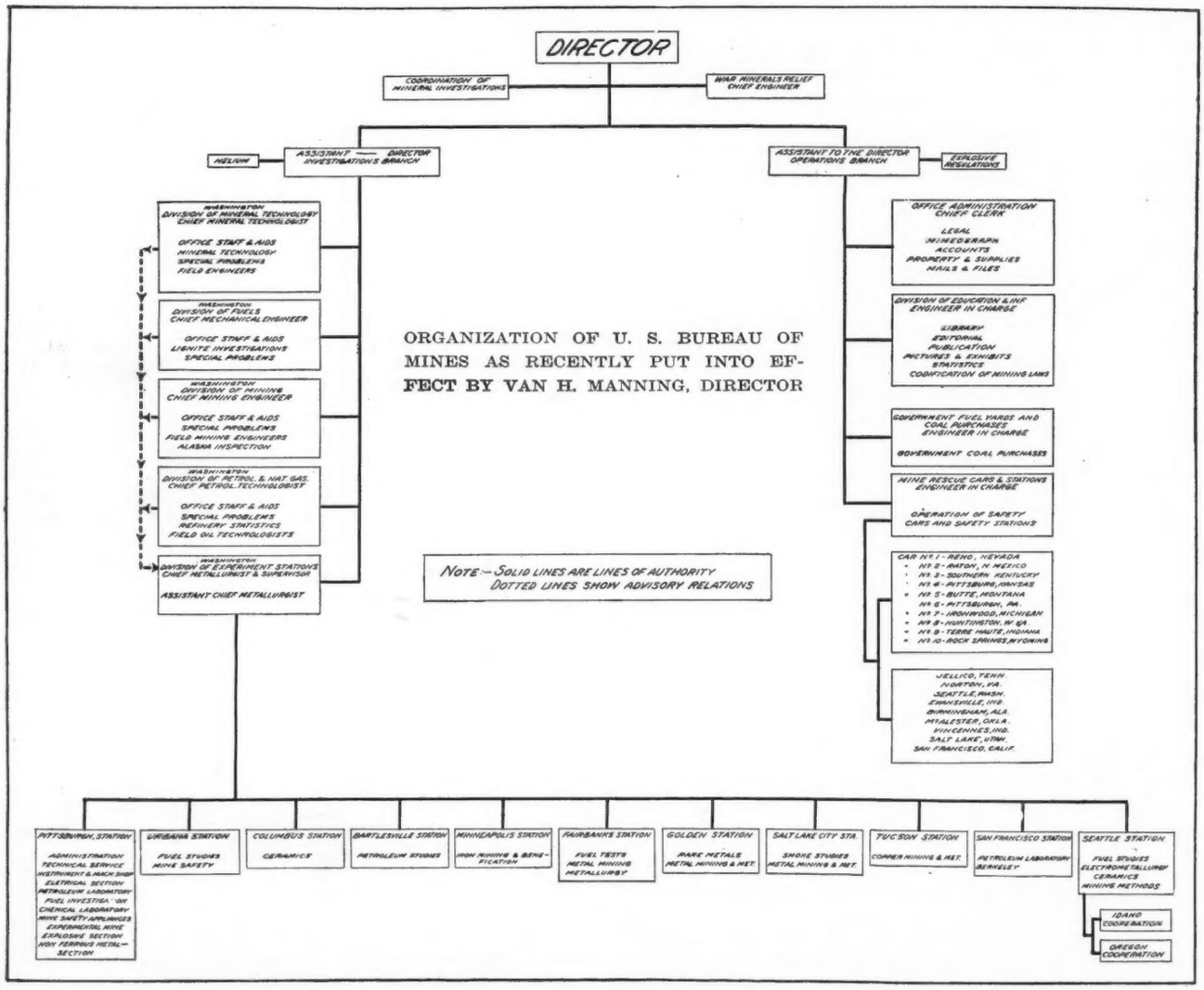
Taking advantage of the lessons in administrative organization which were taught by the war, Van. H. Manning, director of the U. S. Bureau of Mines, has put into effect a new form of organization in the Bureau. This has been divided into two branches, one the investigations branch and the other the operations branch. F. G. Cottrell, who has been chief metallurgist of the Bureau, has been promoted to the position of assistant director and will be in charge of the investigations branch. F. J. Bailey, who has been chief clerk of the Bureau, has been placed in charge of the operations branch, with the title of assistant to the director.

All research and technical control will be exercised through the investigations branch. The non-technical work, administrative duties, and dissemination of the results of the Bureau's activities will be handled by the operations branch.

Under the investigations branch comes the division of mineral technology, in charge of Dr. C. L. Parsons; the division of fuels, under the chief mechanical engineer, O. P. Hood; the division of mining, under the direction of George S. Rice, the chief mining engineer; the division of petroleum and natural gas, under the direction of J. O. Lewis, the chief petroleum technologist, and the division of experiment stations, under the direction of Dorsey A. Lyon.

The operations branch has as its subdivisions the office of the chief clerk, which will be presided over by H. E. Meyer; the division of education and information, with T. T. Read in charge; Government fuel yards and coal purposes, with G. S. Pope in charge; mine rescue cars and stations, with D. J. Parker in charge.

One of the very important divisions is that of experiment stations. The stations under the direct charge of Mr. Lyon, with their respective directors, are as follows: Pittsburgh station, E. A. Holbrook; Urbana station, C. A. Herbert; Columbus station, R. T. Stull; Bartlesville station, W. P. Dykema; Minneapolis station, C. E. Julihn; Fairbanks station, J. A. Davis; Golden station, R. B. Moore; Salt Lake City station, Thomas Varley; Tucson station, C. E. Van Barneveld; San Francisco station, L. H. Duschak; Seattle station, F. K. Ovitz. A. E. Wells has been made assistant supervisor of stations.



War Departments' Metal Sales

Sales of non-ferrous metals and scrap made by the War Department up to July 4 aggregated $18,274,886. The original cost of materials which were sold for the above figures was $28,680,256. Total sales up to July 4 of surplus supplies of chemicals, acids, and explosives amounted to $31,861,853. The original cost of those commodities was $33,043,432.

Meeting of the San Francisco Section of the A. I. M. E.

Members Hear an Important Address on the Creation of a National Department of Public Works by Philip N. Moore, at the Engineers' Club

ON THE evening of July 22, the San Francisco Section of the American Institute of Mining and Metallurgical Engineers held its regular monthly meeting at the Engineers' Club. The guest of the evening was Philip N. Moore, a member of the Minerals-Relief Commission, which completed its work in San Francisco on July 26. In the absence of F. W. Bradley, who is in Alaska, T. A. Rickard acted as chairman and introduced Mr. Moore.

The subject of the evening's address was "New Conditions and Opportunities Confronting the Engineer." Mr. Moore commented on engineering organizations and the tendency of such organizations to become narrow and self-centered. The need for a greater service and more direct contact with engineers on the part of the national engineering societies was emphasized. The formation of the Engineering Council and its rapid growth were described, as well as the work of the National Service Committee, which is keeping in touch with and informing engineers of all national legislation affecting their interests.

The present unsatisfactory condition of governmental engineering service, which is divided among many Government departments, with the result that there is much duplication of effort and consequent loss of efficiency, was brought to the attention of the members by Mr. Moore. Enumeration of the efforts to remedy this condition by the creation of a department of public works, a bill for that purpose having been introduced in both the Senate and the House, and a statement concerning the work of organizing the engineering societies in support of this bill, concluded the address, which was listened to with more than ordinary interest.

After a short discussion and the answering of a number of questions concerning the purpose of the department of public works, the following resolution was circulated and signed by the members present:

We, the undersigned engineers of San Francisco, having read the text of the bill for the creation of the department of public works, desire to express our hearty approval of the measure:

W. H. Shockley	D. H. Harroun
Geo. J. Young	Arthur W. Jenks
F. H. Probert	Wilbur H. Grant
T. A. Rickard	F. W. Varney
W. Burns	Albert A. Alslip
Augustus Locke	Fred Corkill
Clifford F. Dennis	Arthur Jarman
C. N. Schuette	

Mr. Moore has recently delivered addresses on the need of organization to voice engineering opinion upon public questions, one of which, on "The Engineer in Civil Life," was delivered at the engineers' symposium held in New York City on Mar. 26.

The Journal Index

The Index for Volume 107 (January to June, 1919) of the *Engineering and Mining Journal* will be mailed with this issue. Any subscriber not receiving a copy of same should notify the Subscription Department at once.

Exposition of Chemical Industries

Recent Developments in Electric Furnaces, Measuring Instruments and Plant Installations—Meeting of the A. I. M. E.—Papers on Many Subjects

THE forthcoming National Exposition of Chemical Industries at the Coliseum and the First Regiment Armory, Chicago, during the week of Sept. 22 to 27, inclusive, will illustrate in a striking manner the recent developments in the metallurgical industry, principally the advances stimulated by the demand for production during the war.

A noteworthy feature of the exposition will be the number of electric-furnace exhibits. The activity of the war period produced an increased interest in metals, not only in new alloys and in treatment of metal but in the method of manufacture. On exhibit will be the Rennerfelt furnace, Hamilton & Hansell, American agents; the Baily Furnace, shown by the Electric Furnace Co.; the Taylor furnace, by the Industrial Electric Furnace Co.; the Detroit rocking furnace, by the Detroit Electric Furnace Co., and the furnace of Booth, Hall & Co. In the metal department there will be exhibits of acid- and alkali-proof bronzes that are prepared for specific purposes—bronze of sush hardness and strength that instruments made of it are used to cut chilled steel—and other metallic compositions the development of which could not properly be made known until now.

The advance of electrochemistry, particularly as related to electric steel, brass, bronzes, and the furnaces used, has created a broader interest than in the strictly electrochemical field, and the American Institute of Mining and Metallurgical Engineers will hold a joint meeting with the American Electrochemical Society on Sept. 24 to discuss electric steel and electric furnaces. In the evening after the meeting a program of motion pictures upon various phases of electric furnaces in their operation will be shown. On Sept. 26, a joint session on the subject of pyrometry will probably be held. The U. S. Bureau of Mines will have on exhibit about thirty metals, showing the complete course of extraction from their ores and the various materials used in each process.

The numerous instruments, devices, and apparatus that have been perfected during the intense war period for precise measurements of temperature, weights, volumes, velocities, flow of liquids, gases, solids, electric current, and any and all kinds of commodities that are to be measured will occupy a large amount of space. Prominent among plant exhibits will be those of conveying systems, elevating systems, weighing and measuring devices, tiering and stacking machinery, as well as hoists and cranes.

The interest of manufacturers and large companies in the health and welfare of workers in plant, factory, and mine has led to the introduction of numerous devices for the protection of parts of the body, for use in the chemical, gas, electric, metal-smelting, mining and manufacturing industries. The protection of the eyes by goggles and shields, the breathing apparatus by masks, hoods, and breathing pieces, and prevention of accidents by signals and devices will be illustrated. The U. S. Bureau of Mines will feature its safety work in

the plant and the mine, and in connection with this a special program is being arranged under the chairmanship of M. F. Leopold, safety engineer of the Bureau.

In addition to the technical papers, there is also being arranged a program of speakers and motion pictures by the exposition managers, which will include men of national prominence.

Many exhibitors will bring moving picture films now being prepared. The U. S. Government is making numerous technical subject films through the Bureau of Mines, embracing all of that Bureau's work, and these will be shown for the first time. The Bureau of Commercial Economics at Washington is again cooperating with the exposition in equipping it with some films now being made. The Bray Studios are preparing several films in which they will show drawings, taken in such rapid sequence as to seem in motion, that illustrate the manner and conduct of chemical action and reactions usually invisible to the eye and conceived only by the mind in abstract form. The showing of these films will be elaborated and discussed by James Handy, vice-president of Bray Studios.

The titles of some of the films are: "Continuous Motion Conveying, Stacking, Elevating, Loading, and Unloading by Brown Portable Handling Machines" (courtesy Brown Portable Conveying Machinery Co.). "Resistance Type Furnace for Melting Non-Ferrous Metals" and "Electric Furnaces in the Heat Treatment of Essential War Materials" (courtesy of Electric Furnace Co.). "The Detroit Rocking Electric Melting Furnace in Operation" (courtesy Detroit Electric Furnace Co.). "Shawinigan Power Development and the Shawinigan Industries" (courtesy Shawinigan Water & Power Co.). "The Manufacture of Zinc Oxide" (courtesy New Jersey Zinc Co.). "Operation of Koppers By-product Coke Plant" (courtesy The Koppers Co.). "Chemistry in Munitions," "Invisible Chemistry of the Electric Battery," "Invisible Phases of Crystallization," "Formation of Coal Made Visible," and "Chemistry of Gas Engines Made Visible."

The managers of the exposition, Charles F. Roth and Fred W. Payne, have established headquarters in the Chicago office at 417 South Dearborn St.

Chicago Meeting of the A. I. M. E.

Steamer To Be Chartered for Excursion to Gary, Ind.—Technical Session To Be Held While En Route—Entertainment Provided for the Ladies

THE Chicago meeting of the American Institute of Mining and Metallurgical Engineers will be held on Sept. 22 to 26, as previously announced. Among the subjects to receive particular attention will be the iron and steel industry, which has reached such importance in Chicago. It is planned during the meeting for the Institute to make an excursion in a body to Gary, Ind. Arrangements are being made to charter a steamer, which will convey the members and guests across the south end of Lake Michigan, directly to the steel works. A tour will be made through the various departments of the steel plant, and luncheon will be served at Gary. Technical sessions on subjects in ferrous metallurgy will be held on the boat.

The banquet has been scheduled for the evening of Wednesday, Sept. 24, at the Congress Hotel. By putting this function in the middle of the week, it is expected that a maximum attendance can be obtained. Members able to come for only a portion of the session can then be present at the banquet, whether they come for the first or latter part of the week. An elaborate program for the entertainment of the ladies is being prepared.

Legislation Affecting Mining

WASHINGTON CORRESPONDENCE

A duty of $10 per unit on crude tungsten, ores and concentrates is provided in a bill reported favorably to the House July 28 by the Committee on Ways and Means. The bill also provides that metallic tungsten, tungsten powder, ferrotungsten, ferrotungsten powder, commercial tungsten acid, calcium tungstate, sodium tungstate and all other salts of tungsten and other manufactured materials containing tungsten shall pay $1 per pound of tungsten contained therein.

The bill was reported out in exactly the same form as it was introduced by Representative Timberlake, of Colorado. The vote in committee was along party lines, with the exception of Representative Martin, Democrat, of Louisiana, who voted with the Republicans.

The bill providing high rates of duty on laboratory glass and porcelain ware, optical glass, scientific and surgical instruments was also reported favorably. The magnesite bill was discussed, but no agreement was reached by the committee. The potash bill was not taken up.

It has developed that the Tariff Commission is opposed to administering any licensing system. It came to the knowledge of the commission that it had been suggested as the proper body to administer the licensing machinery, and the result was that the commission not only reiterated its opposition to most of the licensing suggestions, but emphatically urged that it not be selected to administer any of the licenses.

Operations at Guanajuato, Mexico

GUANAJUATO CORRESPONDENCE

New capital appears to be interesting itself again in the Guanajuato district of Mexico. It seems safe to say that this camp, formerly one of the greatest producers of silver in the world, will experience another era of prosperity, whether or not intervention occurs. Much interest is being manifested in the coming gubernatorial election, there being two candidates for the office, one Antonio Madrazo, a mining engineer of Laon, Guanajuato, and the other General Frederico Montes, of Irapuato, who holds a commission in the Carranza army. The election promises to be close, as public favor seems to be rather evenly divided.

Owing to the heavy rains that have fallen incessantly during the last month, work has been greatly hampered in the district, the rainy season being the heaviest in ten years. New and more extensive operations are contemplated by the Guanajuato Development Co. at Guanajuato and in outlying districts. Change in the directorate of this company and its subsidiaries, the Peregrina Mining & Milling Co. and the Pinguico Mines Co., was effected on June 12. George W. McElhiney succeeds Willard P. Reid as president. The other officers are P. E. Sharpless, vice-president; Wright Johnson, vice-president and secretary, and W. H. Porter, treasurer. No change in the

management of the mines at Guanajuato will be effected, Keith A. Cunningham still acting as general manager. The New York office of this company is at 50 Broad St.

The Peregrina Mining & Milling Co. is planning to install rock drills, owing to the shortage of labor, which is caused by the natives leaving to plant corn and their reluctance to work in wet stopes caused by the heavy rains.

Construction work on the new 15-stamp mill being erected by the United Mines Co. at Melladito, in La Luz district, has been retarded by the inability to haul freight from Guanajuato as rapidly as heretofore. The road was recently put in fine condition, but washouts caused by the rains have made transportation difficult. It is expected that this mill will be operating in the very near future. Joseph MacDonald is general manager.

At Santa Rosa, the Cia. Metallurgica de Santa Rosa is erecting a 15-stamp mill at its Durazno mine, which is expected to be in operation soon. This company is owned and managed by Mexicans, Andre Villafaña being general manager.

The Coal Situation

No Investigation Likely Unless the Prices Jump—Heavy Buying Expected in Fall—Delay in Ordering May Cause Inconvenience

WASHINGTON CORRESPONDENCE

AS IT IS too late for a coal investigation to do anything but harm, as far as next winter's situation is concerned, it is likely that the matter will be dropped. The Rules Committee of the House already has indicated that the charges made at its hearings are matters for the attention of the Department of Justice. The Senate committee will probably take the same view.

If, however, there should be a decided increase in the price over the present level, there may be a Congressional investigation. The principal influence which worked against a complete investigation at this time was the fear that the public would expect lower prices and would hold off buying.

Domestic stocks in the cities are normal, but in the Middle West and Northwest householders have not as yet laid in their supplies. Large consumers have been buying coal all summer on a hand-to-mouth basis. This includes the railroads. About the time the car shortage, exaggerated by grain movement, becomes most acute, the big consumers will start to buy. Exports will be somewhat heavier, and it is predicted that householders who wait until autumn will have difficulty in securing their supplies. Even in the cities there is a tendency on the part of the public to take chances on another mild winter. If the coming winter should be severe, there will be widespread inconvenience and suffering. If it is mild, there will be no difficulty in meeting coal demands.

Bituminous coal in the ground is plentiful and too widely distributed to make it possible for any group to dominate it. In anthracite the price has reflected the heavy interest and tax charges which must be met by the companies who are holding land for future development. It hardly seems fair that the consumer should pay for the expenses of carrying undeveloped land—but that is another story. Anthracite will probably be available in practically normal amounts next winter. The bituminous situation may possibly not be as alarming as some may have assumed. However, the advertisements and warnings of the National Coal Association are justified and entirely legitimate. The increase in coal prices is not as great as it has been in the great bulk of commodities.

There is much confusion in the bituminous market, which is the cause of much disparity in prices. Railroad bids on the same coal at the same point of delivery vary from $1.65 to $2.50. The same grade of coal was sold in St. Louis week before last at prices varying from $1.15 to $2.65.

July Mining Dividends

Disbursements to stockholders in July, 1919, by eighteen United States mining and metallurgical companies making public reports amounted to $5,705,274, compared with $5,765,456 distributed by thirty companies in July, 1918. Canadian, Mexican, and Central American companies paid $1,715,575, as compared with $864,342 a year ago.

MINING DIVIDENDS

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Am. Smelters, pfd. A	U. S.–Mex.	$1.50	$146,071
Am. Smelters, pfd. B	U. S.–Mex.	1.25	42,962
Caledonia, l.s.	Ida.	.01	26,050
Camp Bird, pfd.	Col.	.18	110,501
Cresson Cons., g.	Col.	.10	122,000
Daly, l.s.	Utah	.10	15,000
Golden Cycle, g.	Colo.	.03	45,000
Homestake, g.	S. D.	.50	125,580
Inspiration, c.	Ariz.	1.50	1,772,951
New Jersey Zinc	U. S.	2.00	700,000
Phelps Dodge	U. S.–Mex.	2.50	1,125,000
Plymouth Cons., g.	Cal.	.24	58,520
Portland, g.	Col.	.02	60,000
Shattuck Arizona, c.	Ariz.	.25	87,500
Tonopah Belmont, g. s.	Nev.	.10	150,000
Tonopah Ex., g.	Nev.	.10	128,280
United Eastern, g.	Ariz.	.07	95,410
U. S. Smelting, com.	U. S.–Mex.	1.25	438,894
U. S. Smelting, pfd.	U. S.–Mex.	.87½	425,555
Wolverine, c.	Mich.	.50	30,000

Canadian, Mexican and Central American Companies	Situation	Per Share	Tota
Asbestos Corp'n., com.	Que.	$1.25	$37,500
Asbestos Corp'n., pfd.	Que.	1.50	60,000
Belmont Surf Inlet, g.s.	B. C.	.05	125,000
Cons. Min. and Sm., c.z.l.	B. C.	.62½	261,936
Howe Sound, c.	B. C.	.05	99,208
McKinley-Darragh-Savage, s.	Ont.	.03	67,431
Nipissing, g. s.	Ont.	.50	600,000
Santa Gertrudis, g.	Mex.	.24	364,500
N. Y. & Honduras Rosario, g. s.	C. A.	.50	100,000

The totals for the first seven months of 1919 are as follows, the 1918 figures being given in parentheses: United States mining and metallurgical companies, $55,745,066 ($95,528,466); Canadian, Mexican, Central, and South American mines, $9,775,856 ($10,584,028); holding companies, $900,005 ($1,066,866).

Italian Imports in 1918

According to *La Metallurgia Italiana*, reprinted in the *Ironmonger*, imports of the principal ores and metals into Italy in 1917 and 1918 were as follows:

	1918, Metric Tons	1917, Metric Tons
Iron ore	1,951	313
Manganese ore	5,452	21,538
Lead ore	5,478	4,838
Copper ore	404	467
Pig iron	115,211	315,953
Steel ingots	5,411	42,894
Aluminum and alloys	5,008	3,996
Nickel and alloys	3,215	3,293
Lead and antimony	45,165	32,372
Copper, brass and bronze	80,533	93,640
Tin and tin alloys	2,341	3,266
Zinc	10,749	19,383

BY THE WAY

Pay Today, Trust Tomorrow

The Department of State has been advised by the American Embassy at Mexico City, as well as by the Mexican Ambassador to the United States, Mr. Bonillas, that the Mexican government will authorize the temporary boring of oil wells provided the interested parties apply to the Department of Industry and Commerce for such permits under the formal promise that they will be subject to legislative regulations that may be enacted in the future by the Mexican government. The Department of Industry and Commerce is to issue at once a circular "relative to this matter."

Pike's Peak Without Busting

Bucking snow drifts for the last two miles at an altitude above timber line, climbing steep grades and rough places where only Dr. Cook would feel perfectly safe, a five-ton caterpillar tractor gained the summit of Pike's Peak on June 16 and had its picture taken. Rather cold for most caterpillars to be out, but not for this one! Having seen what was on the other side of the mountain, like the bear of song and story, it went back to Denver on June 17, after running 235 miles.

A CATERPILLAR ON PIKE'S PEAK

The Origin of the Tank

The cause and origin of the tank was Hugh F. Marriott, president last year of the Institution of Mining and Metallurgy. So said Major General E. D. Swinton at the Institution's dinner on Apr. 10 last in London. General Swinton's remarks are reported in the society's *Bulletin* in part as follows:

In July, 1914, Mr. Marriott wrote to him from Antwerp —where his job at the moment was trying to find out some cheap and efficient form of transport across rough country for mining purposes. He knew all about rope railways, telpherage, narrow-gage railways, and so on, and informed him that in Antwerp he had seen an American caterpillar tractor which would go over rough country and "climb like hell." This, it must be remembered, was before the war. He (General Swinton) was able to go to the War Office and the Admiralty and tell the people concerned that there was an American tractor in Antwerp which would, in the words of his friend, "climb like hell," and that it was up to them to investigate it for tractive purposes. The machine referred to was the Holt tractor. Shortly after that he had gone out to the war, as a journalist, and his position gave him an opportunity of seeing and learning a lot. It was then that he became convinced that a machine which could "climb like hell" was a thing not to be lost sight of, and if it could be developed or improved into a bullet-proof machine that could climb "to beat hell" they had something which might meet the German machine guns.

Mr. Marriott replied that had it not been for General Swinton's initiative and determination in the face of inertness and opposition to push the idea of that caterpillar tractor, together with the details of construction which were essential for its success, he did not believe that the British would have had a tank in action.

"Speaking of Operations"

"I 'as mentioned tha fac' befor that this 'ere physical h'examination be a gert thing, m'son," said Cap'n Dick. "Dam-me, there be many o' tha minin' companies 'ave un naow, an' tha practus seems to work h'out 'andsome. There h'often be them 'ookem-snivey rascals 'o is lookin' for some chance to do tha company, an', dam-me, this 'ere seems to be one way to beat un. Then there be they chaps 'o look 'ale an' 'earty, an' in troth they be nothin' but a bloody shell, an' firs' thing tha super naws 'e's payin' h'out 'alf-time wages for sumthin' that's no bloody fault o' tha company's at all. Speakin' o' this physical h'examination reminds me o' tha story baout Jimmy Trebilcock. Jimmy, 'e decided some time h'ago that 'e would take h'out some life h'insurance, so h'up 'e gaws to see one o' they doctors an' 'ave un gaw h'over 'e. Tha doctor 'e geeks Jimmy from 'ead to foot, an' then 'e starts soundin' 'im with one o' these 'ere stethescopes. After 'e gets h'all through, 'e says to Jimmy, 'Tha h'only thing I can fin' wrong is that thee seems to 'ave some h'organic trouble.' 'What's that?' says Jimmy. 'I says thee seems to 'ave some h'organic trouble,' repeated they doctor. 'Oh, gos along,' says Jimmy,' thee mus' be wrong baout that. There's nothin' musical baout me.' " D. E. A. C.

Separations, Limited

"Aha, Bill," said the shift boss, as he retrieved his tobacco pouch; "so ye do not favor Separations Limited." "Thanks to recint decishuns av the coorts," replied the thick-skinned borrower, "this here siparayshun av the laborin' man an' his pleasure is goin' beyond the limit. Afther the byes took to warin' thim buttons that sez 'may we not have our beer?' it looked like we might get to the root av things on a percintage decishun. Some fellies contind that with less than 2.75 percint av the necess'ry ingrejint, a good froth is had, and the gang is depressed accordin' to spicificayshuns av the killjoys. On the other hand, the bluenoses contind that while a good froth may be had without elevatin' the spirits and that froth may be had at almost anny fraction av the stated percintage, nivertheless it is not the froth alone that is claimed to do the work; but raythe the idea av a percintage av admixture, av which idea the froth was a symbol and constituted, with the aid av the risin' bubbles of gas, a definite means av evadin' the patent fact that the whole object av the aminded process was to prevint anny elevayshun of the spirits; an' that the depreshun av the gang was merely incidental an' not to be regarded as anny fundamintal part av the process an' not particularly desirable except as it contribbyted to the reduction av convivyality, an' thus assisted the major function av the perficted process. An' now, Mister Clancy, I'll trouble ye for a match."

PERSONALS

J. LEONARD REPLOGLE, who was Steel Director of the United States and responsible for the allocation of steel supplies during the war, has been recently made a Chevalier of the Legion of Honor by the French government in recognition of his services.

J. LEONARD REPLOGLE
Photograph from Underwood and Underwood, N. Y.

Mark L. Requa is again in the East after an extended trip through the West.

W. Parsons Todd, vice-president of the Quincy company, visited the property last week.

Leon M. Hall has opened offices as a consulting engineer at 7434 Call Building, San Francisco.

M. O. Carlson, recently mining engineer with Burma Mines, Ltd., Burma, India, has returned to Denver, Col.

Kirby Thomas is making an examination of chrome and asbestos properties at Black Lake and Danville, Quebec.

H. E. Beauchamp, of Douglas, Ariz., is making examinations in the Virginia and Gold Hill districts, near Lordsburg, N. M.

W. Jacobson, of Toronto, Ontario, has taken charge of the developments on the Ross lot for asbestos and chrome at Black Lake, Quebec.

Ralph V. Davies has accepted a position in the technical control department of the Aluminum Co. of America, New Kensington, Pa.

Bennett Bates, representative of the Dorr Co., is visiting the principal mining districts of southern Mexico on business for the company.

Joseph S. Qualey, of New York, president and general manager of the Matachewan Gold Mines, of northern Ontario, is on a visit of inspection to the property.

F. G. Cottrell, who has been studying the mineral situation in Europe, will return to Washington about the middle of August to assume his new duties in connection with the Bureau of Mines.

Douglas D. Moffat, consulting engineer for the Jackling mills, is in Salt Lake City. Mr. Moffat was superintendent of the Ray Consolidated mill at Hayden, Ariz.

Hubert C. Field, one of the directors of the Guanajuato Development Co., is in Guanajuato investigating matters relative to new operations contemplated by his company.

W. R. Crane, of the mineral commission, Washington, has been making an examination of the chrome and manganese deposits in the vicinity of Black Lake and Coleraine.

John L. Church has returned to civil life after serving for 18 months as a captain in the engineer corps. Captain Church has opened an office in Kohrs Block, Helena, Mont.

Henry Leighton, professor of economic geology, University of Pittsburgh, has returned from a month's investigation of mica and feldspar mines in North Carolina and Georgia.

Robert Harvie, geologist, and **Eugene Pointin,** mineralogist, from the Department of Mines, Ottawa, are continuing their investigations of the serpentine belt in the Thedford district.

N. Palmer, formerly manager of the Worthington nickel mine, Sudbury, Ontario, has been appointed general superintendent of the Black Lake Asbestos and Chrome Co., of Black Lake, Quebec.

Adolph Lewisohn was presented with a large silk American flag by Mayor Hylan at one of the series of People's Concerts in Central Park, New York, in recognition of his musical gifts to the public.

L. W. Ledyard has resigned his position as manager of the Beaver Consolidated property in the Cobalt district and the Kirkland Lake gold mine, and will take up his residence in the Southern States.

A. G. Burrows and **Cyril Knight,** of the Ontario Bureau of Mines, are making geological surveys for a map embracing the Kirkland Lake, Boston Creek, Larder Lake, and Skead Township gold areas.

Henry P. Smith, general manager of the Guanajuato Reduction & Mines Co., Guanajuato, Mexico, is at the present time in Los Angeles, Cal. Mr. Smith will return to Guanajuato in the early part of August.

F. C. Wallower has returned to Joplin after attending the Rotary convention at Salt Lake City and visiting some of the larger mining properties in Idaho. Mr. Wallower is manager of the Golden Rod Mining & Smelting Co.

Arthur Thacher, western manager of the New Jersey Zinc Company, with headquarters at St. Louis, made his second visit to the Joplin-Miami district and attended the weekly meeting of the Tri-State branch of the American Zinc Institute at Picher on July 23.

Arthur Lakes, Jr., mining engineer, has returned from service in France and rejoined his firm of Larson & Lakes at Spokane. Mr. Lakes was promoted to major while in charge of administration, transportation, and construction at Neufonateau.

F. J. Bailey, of the U. S. Bureau of Mines, has been promoted to assistant director of the Bureau of Mines, and **H. E. Meyer,** who has been secretary for the Minerals-Relief Commission, at present in San Francisco, has been promoted to chief clerk of the Bureau of Mines.

T. D. Jarvis, pathologist of the International Nickel Co., Copper Cliff, Ontario, left recently on an extended trip through the West to study the smeltery-smoke problem and its effect on vegetation. His itinerary includes Salt Lake, San Francisco, Anaconda, and Seattle.

N. O. Lawton, general superintendent of the Vermont Copper Co., South Strafford, Vt., is at Pilleys Island, Newfoundland, superintending diamond drilling at the old Pilleys Island mine to explore for the extension of the vein. Mr. Lawton was manager of this mine 13 years ago.

Zach Lamar Cobb, formerly collector of customs and agent of the Department of State at El Paso, Tex., and thereafter attached to the War Trade Board at Washington as adviser on Mexico, announces that he has resumed the practice of law, with offices in Anson Mills Building, El Paso, Tex.

HARRY J. WOLF

Harry J. Wolf, for a number of years a practicing mining engineer with headquarters in Colorado, and professor of mining in the Colorado School of Mines, has become associated with the *Engineering and Mining Journal,* as assistant editor. Mr. Wolf was formerly secretary of the Colorado Scientific Society and his report for the year ended Dec. 18, 1918, has just been published.

MINING SCHOOLS

Cambridge University has received the gift of $1,050,000 from British oil interests which have united in a scheme for endowing a chemical school at this university. The *London Daily Mail* states that the donors are the Burmah Oil Co., the Anglo-Persian Oil Co., and the Anglo-Saxon Petroleum Co., which give $250,000 each; Lord Cowdray and Clive Pearson, who give $125,000 each, and Mr. Deterding, who personally contributes $50,000.

INDUSTRIAL NEWS

Sprague Electric Works of the General Electric Co., New York, has issued a pamphlet descriptive of Sprague electric ozonators for cold-storage warehouses.

A. H. Simpson Co., dealers in used mining machinery, announce the removal of their salesroom and general offices to 129 Fremont St., San Francisco., Cal.

Chicago Pneumatic Tool Company announces the appointment of N. S. Thulin as special railroad representative on the staff of S. C. Sprague, manager of western railroad sales.

McKiernan-Terry Drill Co., 15 Park Row, New York, has published a bulletin describing three sizes of rotating hammer drills. Sizes F-2 and F-44 are furnished with a water-feed attachment for allaying the drill dust.

United Filters Corporation has recently established a sales office at 35 Montgomery St., San Francisco, Cal., under the direction of the Western Steel & Engineering Corporation. In addition to this office, the company's activities on the West Coast are also taken care of by Kennard & Bierce, of Los Angeles, and the United Iron Works, of Spokane, Wash.

International Motor Co. has distributed a five-page circular by R. E. Fulton, vice-president, in which a comparison is given of the cost of handling freight by motor trucks and railways. A table is included giving relative costs for each kind of transportation between New York and a number of important Eastern localities. A number of other details, including weight of moisture carried by boxes, delivery time and working days and miles per year, are discussed.

Armstrong Cork and Insulation Co., Pittsburgh, Pa., has issued a pamphlet with a circular insert entitled "Saving 63 per cent of the Drinking-Water Expense," and devoted to a discussion on modern drinking-water systems which maintain a palatable temperature, eliminates the use of the drinking cup, and claim a reduction in cost of supplying drinking water to workmen from $5 to $1.82 per man per year, according to milling plant records. The company has published a 48-pp. book on the subject "Drinking-Water Systems," which will be sent free upon request.

Sullivan Machinery Co., Chicago, Ill., announces the resignation of Phillips F. Jarvis as sales manager for the territory controlled from its St. Louis office. The following appointments have been made: Marion C. Mitchell, sales manager in Indiana and Illinois, previously controlled from the St. Louis office, with temporary headquarters at Railway Exchange, St. Louis; Don M. Sutor, formerly manager of the El Paso office, sales manager for western Kentucky, western Tennessee, Missouri, Arkansas, Oklahoma and Kansas (except the oil territory), with headquarters at Railway Exchange, St. Louis; Daniel H. Hunter, sales manager for Louisiana, Texas (except the southwestern section), and the oil fields of Oklahoma and Kansas, with headquarters in Dallas, Texas.

Thompson Starrett Co. has published a brochure containing a number of pictures of the accomplishments of the company since its organization about eighteen years ago. This company organized the Chile Exploration Co.'s construction department, and, in the earlier stages of the construction of the reduction plant in South America, acted as advisory contractor. One illustration shows some parts of a larger construction program originally planned but temporarily restricted by the great war. The cost was $20,000,000. The Thompson Starrett Co. has executed a total of over 400 contracts, involving a grand total of more than $300,000,000, of which 52 were over one million dollars, 22 in excess of five millions, 7 in excess of ten millions, and one exceeding sixty-five millions of dollars.

TRADE CATALOGS

Texaco Petroleum Products. The Texas Co.; 9½ x 12; 46 pp.; illustrated. Descriptive of the lubricants manufactured by the company, and their uses.

Hammer Drills. Sullivan Machinery Co., Chicago. Pamphlet 118, 3¼ x 5½; 32 pp.; illustrated. Descriptive of Sullivan hammer and rock drills, in which is shown and described a drill for every kind of rock excavation in mine, quarry or on public work. Various types of compressors manufactured by the company are also described.

Soot Cleaners. The Vulcan Soot Cleaner Co., Du Bois, Pa. Bulletin No. 541; 8½ x 11; 8 pp.; illustrated. Describes the Vulcan patented diagonal method for cleaning soot from tubes of horizontal water tube boilers. A discussion on "The Cost of Vulcan Cleaners and an Analysis of Their Value as Investments" is included.

Crushing Rolls. Allis-Chalmers Manufacturing Co. Bulletin 1,816; 8 x 10½; 15 pp.; illustrated. Descriptive of various designs of rolls which have been manufactured for many years. Tables of dimensions are included. Bulletin 1,817 is devoted to the care and upkeep of crushing rolls; also data for the determination of sizes of feed, speeds, and capacities.

Ruth Laboratory Testing Flotation Machine. The Mine & Smelter Supply Co., Bulletin 57; 6 x 9; 8 pp.; illustrated. Descriptive of a laboratory flotation machine which is manufactured in two sizes called Junior and Type "X," 6 in. The Junior will treat a charge of one kilo, and Type "X" will handle about 10 lb. The smaller type has a glass front and weighs, with stand, 115 lb.; the larger weighs, with stand, 165 lb. Both types are composed of a single cell having an anti-swirl plate, and are furnished either with or without a motor.

NEW PATENTS

U. S. patent specifications may be obtained from the Patent Office, Washington, D. C., at 5c each.

Aluminum. Process for Securing Metals From Their Compounds. Victor M. Weaver, Harrisburg, Pa., assignor to Weaver Co. (U. S. No. 1,297,946; Mar. 18, 1919.)

Aluminum Alloy. Archibald O. Mason, Chicago, Ill. (U. S. No. 1,305,300; June 3, 1919.)

Aluminum Alloy. Henry C. Kirk, Roland Park, Md. (U. S. No. 1,305,551; June 3, 1919.)

Bins—Telltale and Means for Controlling the Feed of Material to Hoppers or Bins. Charles J. Gadd, Lebanon, Pa.; Anna Eyre Gadd, executrix of said Charles J. Gadd, deceased. (U. S. No. 1,304,553; May 27, 1919.)

Briquet Machine. Swan E. Moren, Biwabik, Minn. (U. S. No. 1,306,309; June 10, 1919.)

Cables—Composition for Protecting Wire Cables, Ropes and Other Bearing Surfaces. Ephraim J. Keith, Sikeston, Mo. (U. S. No. 1,305,222; May 27, 1919.)

Conveyor Cable. Hugh F. Ellard, Gilmore, Idaho, (U. S. No. 1,305,204; May 27, 1919.)

Drill—Mine Drill. Frank Kalata, Springfield, Ill. (U. S. No. 1,305,219; May 27, 1919.)

Fuel—Feed Regulator for Powdered Coal. Hanson Thomas and John Dahlstrom, Pittsburgh, Pa. (U. S. No. 1,304,407; May 20, 1919.)

Leaching—Apparatus for Treating Solid-Bearing Solutions. Lamartine C. Trent, Los Angeles, Cal. (U. S. No. 1,307,329, June 17, 1919.)

Placer-Gold Separator, Rotary. Otto V. Bauer, Alamosa, Col. (U. S. No. 1,303,233; May 13, 1919.)

Siliceous Ores, Method of Treating George H. Wigton, Eureka, Utah. (U. S. No. 1,305,327; June 3, 1919.)

EDITORIAL CORRESPONDENCE

Current Events and Topics in Brief of Interest to Engineers and Operators

PORTOLA, CAL.—July 24

At the Walker Mine considerable progress has been made in the erection of the aerial tramway for connecting the mine with the Western Pacific R.R. at Spring Garden. This tramway has the following principle features: Length, approximately nine miles; elevation loading terminal 6,000 ft.; elevation discharge terminal, 4,000 ft.; elevation high point, 7,000 ft.; initial capacity, six tons concentrates per hour; ultimate capacity, twelve tons concentrates per hour. The tramway is of the Leschen heavy-duty friction-grip type. There will be eight tension stations and 104 towers. The track ropes are to be 1¼-in. and 1-in. diameter of locked-coil construction, and the traction rope will be ¾-in. The carriers for handling the concentrates will be of 6-cu.ft. capacity, and there will be special carriers for handling merchandise and supplies from the railroad to the mine.

RENO, NEV.—July 24

The Old Tybo Mine, 60 miles northeast of Tonopah, will be unwatered at once and developed on a comprehensive scale, according to F. W. Draper, consulting engineer and general manager of the Louisiana Consolidated Mining Co. Plans for building a smeltery on the ground are also being completed. The Tybo ores contain silver, gold, lead, and zinc, the silver running quite uniformly two ounces to the per cent of lead. During the 70's the Tybo mine was extensively operated and produced several million dollars' worth of ore, the most of it being smelted, but in 1876 a 20-stamp mill was erected and treated 42,000 tons, producing bullion containing 834,000 oz. of silver and 5,050 oz. of gold. Considerable ore is now opened up in the mine. A report made by John B. Farish in 1910 estimated the ore to average about $17 per ton, with silver at 52c. per oz. and lead at 4c. per lb. The present operations have been financed by the sale of bonds, most of which were taken by holders of stock in the Louisiana company.

BISBEE, ARIZ.—July 24

At Bisbee, an increase of 50c. to $1 a day in wages, to date from July 16, has been announced for copper miners in the Warren district, and for smeltery employees at Douglas. According to G. N. Dowell, general manager of the Copper Queen, the new scale will be on the basis of 24c. copper because of the continued high cost of living.

EL PASO, TEX.—July 24

El Paso Chamber of Commerce, through its board of directors, recently passed a resolution endorsing the National Association for the Protection of American Rights in Mexico. At the same time other chambers of commerce in that section of the Southwest were urged to pass resolutions of a similar nature.

The War Camp Community Service at El Paso has received requests from the managers of various mining companies in Arizona and New Mexico asking the service to send them discharged soldiers who are machinists, mechanics, boiler makers, carpenters, plumbers, tinsmiths, miners and muckers. They offer to furnish transportation.

A Study of Mining Laws of various states is being made by New Mexico mining men, aided by the state mine inspector and members of the faculty of the State College near Las Cruces. An attempt will be made to secure legislation to the end that taxation of the mining industry shall be in just proportion to taxes paid by other industries.

AUSTIN, TEX.—July 23

Small Refineries dependent upon daily production from the Burkburnett field were taken care of by one or two of the largest producing companies during the enforced shutdown of the northwest extension of the field. Oil speculators were hard hit.

Burkburnett Northwest Extension was reopened July 18 by order of the railroad commission after a five-day shutdown. Investigation showed that overproduction leading to a possible break in the price of light crude oil was more feared than wastage, and as former was not considered within commission's jurisdiction it was decided the shutdown would not continue. Orders were issued on July 18 to prevent further wastage by stopping all leaks and overflows of oil.

WALLACE, IDAHO—JULY 24

Forest Fires have destroyed large bodies of timber on the North Fork of the Coeur d'Alene River, and are still raging. The prolonged dry spell has been especially favorable to fires, and is also making water supply for mining purposes a serious problem. There has been no rain since about June 1. As the usual dry season starts about this time and continues until September, the outlook for relief is not encouraging.

Wages Have Been Advanced 50c. per day, effective as from July 16, by Coeur d'Alene mining companies. This restores the war-time bonus, making the wages of underground men $5.25 per day. This increase was one of the demands made several weeks ago by the miners' union. In making the advance, the companies explain that it is due to the recent rise of about half a cent in the price of lead. In a statement issued several weeks ago following the demand of the union, when lead was around 5c., it was stated that an increase of wages was impossible owing to the condition of the lead-mining industry, and that some of the companies were then operating at an actual loss.

Butte Stockholders in the Tarbox Mining Co. failed to oust Richard Daxon as manager at the annual meeting of stockholders in Wallace on July 21. Daxon controlled in round figures 900,000 shares of the 1,600,000 issued, whereas the Butte faction could muster fewer than 500,000. Protesting against what they claimed was illegal proceedings in the organization of the meeting, the Butte faction withdrew and elected a board of directors, claiming to have a majority of the stock. At the regular meeting directors were elected and Mr. Daxon was re-elected president. The Butte stockholders have announced that they will ask for the appointment of a receiver to take over the affairs of the company. The mine is developed to a depth of 1,000 ft., and a large body of lead-silver-zinc ore has been exposed, especially on the 800 and 1,000 levels. The mine is about three miles from Saltese, Mont.

BUTTE, MONT.—July 25

Unprecedented Low Water in Montana may seriously affect the operations of the Washoe reduction works of the Anaconda company. At present the plant is working at 40 per cent capacity, owing to industrial conditions at the Butte mines. Silver Lake, near Anaconda, the present source of water supply, will be exhausted within several months, and Anaconda is planning to use the waters of Georgetown Lake. The latter is about three miles distant from Silver Lake, from which the water flows by gravity to the Washoe plant. Pumping will be necessary.

SALT LAKE CITY, UTAH—July 24

Underground Accidents in Metal Mines in Utah have thus far in 1919 been unusually few in number, according to the report of the inspector of mines for Utah, there having been but one fatal accident in six months, as compared with sixteen accidents for the twelve months of 1918, showing that the efforts of the mining companies to safeguard the employees, seconded by the men themselves, are bearing fruit. For surface work the record is not so good, there having been three fatal accidents in 1919 thus far, as compared with eight in 1918 and four in 1917.

Wages in practically all of the camps of Utah are being restored to the high level reached during the war, in anticipation of a better metal market, of which there are indications, and in view of the high cost of living for employees, which has shown no appreciable decline. The wage scale is: Machine men, $5.25; machine men's helpers, $5; miners, $5; muckers, $4.75; timbermen, $5.25; laborers, $4. With the metal market not yet stabilized, costs with few exceptions as high as ever, and both state and Federal taxes heavier than heretofore, the move made voluntarily by the operators is a lien on the future prosperity of the industry, and for the present will be felt by many companies as an added burden. The first relief has come in the rise in the price of silver, and with copper going up there is prospect that the mines—in a number of cases reduced to 50 per cent of their normal output—will soon be able to increase production.

In regard to the price of silver, Utah producers of that metal, through the local chapter of the American Mining Congress, are protesting the proposal of the Treasury Department to deliver 100,000,000 oz. of silver to England for coinage purposes at $1 an oz. The industry, it is felt, should profit from the favorable price of silver. Price fixing was cheerfully accepted during the war as a measure for stabilizing the market, but it is now felt that peculiar conditions no longer exist, and that the market should be open on equal terms to all buyers, whether foreign or domestic.

DENVER, COL.—July 24

New Freight Rates on ore and concentrates shipped from Boulder, Gilpin, Clear Creek, Summit, and Park counties, Colorado, to the Pueblo smeltery became effective on July 21. The new rates are equivalent to a reduction of 20 to 25 per cent. It was announced on June 30 by the Denver district freight traffic committee that authority had been received from Washington to make new rates effective on thirty days' notice to the Interstate Commerce Commission. This action was taken upon application by the Colorado Metal Mining Association, supplemented by the efforts of the local mining organizations of the counties mentioned. The closing of the Globe plant of the American Smelting & Refining Co., at Denver, necessitated shipping to Pueblo at an additional freight cost of $1.30 per ton.

JOPLIN, MO.—July 26

Labor Shortage has developed in the Joplin-Miami district, but there is no semblance of labor troubles. Mine operators are paying $1.50 per day more than they were three or four years ago, and recently raised wages approximately 25c. per day when the price of ore went above the $50 mark. This is in accordance with an unwritten agreement entered into between operators and miners several years ago, whereby wages mount 25c. per day with every $10 increase in the base price of zinc ore. The shortage of shovelers, however, has caused much rivalry between different mines, and a bonus is being paid at many properties.

Sale of the M. & M. Mine to the Niangua Mining Co. was recently completed, the consideration being $150,000. The M. & M. mine is on the west twenty acres of a forty-acre tract bought by the Niangua company two years ago from Charles Stricker, of Miami, Okla., for $40,000. The Niangua company sold the west 20-acre lease for $40,000 to Hare Mining Co., about a year and a half ago. The Hare company developed the tract by drilling and built a concentrator. The Niangua company also built a mill, and both plants have turned out considerable ore, though the Hare plant was shut down on account of low ore prices last winter. Seven weeks ago V. V. Grant, J. K. Moore, S. Walker, and J. W. Keys bought the mine from the Hare company, paying $100,000. They developed some rich ground and made a profit of $10,000 in the seven weeks they operated, and were loath to close the option they had given for the property to the Niangua company soon after they com-

pleted their purchase from the Hare company. The property henceforth will be known as the Niangua No. 2.

Draining of a Large Area of zinc and lead lands west of Baxter Springs, Kan., is under way by the Chanute Spelter Co., a subsidiary of the American Metal Co. Pumping equipment includes two 10-in Pomona pumps, an 8-in. and two 6-in. American two-stage pumps, and two additional Pomonas at another shaft. Water is being hoisted at the rate of 7,500 gal. per min. The drainage plan has been worked out differently than are most schemes of the sort in this district, in that a shaft was sunk in solid lime to 100 ft. below the water level, and then 100 ft. to the water.

Before reaching the water a steel gate embedded in concrete was constructed 10 ft. from the shaft, and it is equipped with four 12-in. pipes to permit feeding the water to the shaft in any amount up to 5,000 gal. per min. The Chanute Spelter Co. has erected a big mill at the site of the principal pumping plant, which is on the Hartley land west of Baxter, and also owns about 25,000 acres of leases in the same section, upon which no fewer than 20 mill sites have been drilled out. With the drainage of the lands many mines will be started toward full development.

DULUTH, MINN,—July 21

Contract Wages for Miners on the Minnesota iron ranges are averaging $6.50 and $7 a day, and the men are pleased with the system, as they are not working nearly as hard as they did four years ago at about half the money. Wages of skilled gangs of miners are running all the way up to $10 and $11 a day. In the open-pit mines, men on the track gang, the most unskilled labor of all, are making $4.84, and pit men $5.28 a day. Locomotive firemen, running small mine engines, make $5.50, and engineers nearly $7 a day. A shovel craner makes $7.48, and the runner, the real aristocrat in the mining field, $10 and $11 a day. The last-named employee, with a little overtime, is able to run his pay check up to $400 a month. Under these conditions labor agitators are finding small encouragement in the ranges territory. Meetings have, however, been held at most of the range towns recently, in which the speakers exhorted the men to strike for still higher pay, or for a six-hour day, or for recognition of the union, and incidentally to make liberal donations to the "Red" cause. The miner is asserted, however, to be too smart for the agitator, remembering the I. W. W. strike of 1916, for which he paid heavily in losses of wages.

IRONWOOD, MICH.—July 26

Labor Situation on the Gogebic Range is satisfactory. The expected large surplus of labor due to demobilization and dullness of steel and copper markets did not appear, although for a time there was a moderate over-supply. Now, however, there is hardly more than the usual number of "drifters" looking for employment.

HOUGHTON, MICH.—July 30

Calumet & Hecla on July 30 presented gold medals to all employees who have served the corporation for a period of forty years, silver medals to those in the service thirty years and bronze medals to those who have worked for the company continuously for twenty years. In this the company was following a custom established in 1916, when it celebrated its semi-centennial.

Copper Production in the mines of northern Michigan will not get back to normal during 1919 unless there is a radical change in the labor situation. Though a reasonable percentage of the Michigan miners are coming back from the automobile industries, there will not be enough in total to offset the number who left in the spring. Mine managers believe that the days of cheap production are gone for good. The limits of the metallurgical improvements, it is generally believed, have been pointed out, as applied both to the conglomerate and the amygdaloidal formations. Other changes that may operate to offset the higher wages will have to come in the mining end.

BIRMINGHAM, ALA.—July 26

In the Bessemer District production is expected to reach a high mark within the next few months. The ore mines on Red Mountain are resuming operations, and furnaces and mills in the city proper are starting up or increasing their output. The Woodward Iron Co. has reopened its Songo mines, near Bessemer, and ten cars of ore per day at first is expected, though this will be increased as labor becomes more plentiful. With four of its five furnaces going, the company is putting its mines to work on full time, and in some cases has night shifts in order to supply the ore needed by the furnaces. This company is said to have sold considerable iron ahead, and with consumers asking for immediate delivery of orders, shipping is increasing each day.

A strike at the Virginia mines of the Gulf States Steel Co., brought about by the refusal of the men to wear a new safety lamp, has been ended by the men finally agreeing to its use.

A tax of 3c. per ton on iron ore and 5c. per ton on coal has been approved by the Ways, Means and Appropriation Committee of the Alabama State Legislature. This tax, should it pass, will be a staggering blow to the two main industries of the state and shows an intention to put an unfair burden of taxes on the coal and iron district of Alabama. It is particularly regretted at this time, when all branches of the iron industry are struggling, with some hope of success, to offset the heavy losses of the first half of the year.

A bill has been passed, and is awaiting the Governor's signature, requiring labor agents who are shipping men out of the state to procure a $2,500 state license, and giving the city and county the right to issue licenses also, not to exceed 50 per cent of the state license. In addition, the bill requires that a bond of $5,000 be furnished by the labor agent. When it becomes law, the bill will stop the large shipments of labor to the North, which has seriously crippled industries in this distrct, particularly the mining divisions of the larger companies. The labor situation shows slight improvement during the last week of July over the first week, but the shortage is still serious, particularly at Bessemer, the main point from which the labor has been shipped.

PACHUCA, MEXICO—July 23

The Aerial Tramway being installed by A. Leschen & Sons Rope Co., of St. Louis, for the Compañia Beneficiadora de Pachuca, S. A., is nearing completion. This is one of the most notable aerial tramway installations in Mexico, the line being about 4½ miles in length, built in two sections, with an angle station about midway, which also serves later as an intermediate loading station. The initial capacity of this tramway is 60 tons of ore per hour, with an ultimate capacity of 100 tons per hour. Locked-coil track ropes are used, and a patent flattened-strand traction rope. The carriers are of 16-cu.ft. capacity.

TORONTO, ONTARIO—July 25

All Miners of the Cobalt Camp went out on strike on July 23. About 2,000 men are affected. No attempt is being made to operate, and, as power has been cut off, the mines will be allowed to flood, except where the companies can generate their own power for pumping purposes. The strike in many respects was peculiar, as the men almost without exception stated that they did not want to strike. They worked to the last where wanted, and made every effort to assist the managment in getting out the pumps and machinery. Practically the only point involved was the recognition of the Western Federation of Miners, which the managers have consistently refused to grant. The wages paid are with few exceptions as high as any paid on the continent, and the working conditions are of the best. A bonus is paid according to the price of silver. In June the lowest paid surface men received $4 a day and the rate underground was from $4.25 for muckers to $5 for drill runners. Shaft and winze men received $5.50. The managers, it is said, have no objection to a union of miners for Northern Ontario which will take out an Ontario charter and be absolutely free from domination by the Western Federation, but would recognize and deal with such a union. The situation has been complicated by the attitude of the Minister of Labor for the Dominion Government.

The American Cyanamid Co., which has a plant at Niagara Falls, Ontario, has been endeavoring to find a market for its low-grade cyanide in northern Ontario. The Canadian-made cyanide contains only about 35 per cent NaCN, as compared with 76 per cent and 96-98 per cent NaCN contained in the imported article. The manufacturers claim that this is immaterial to the consumer, who pays only for the actual cyanide present as determined by analysis, and that they can deliver actual cyanide in this form at a cost of from 20 to 30 per cent below the current price of imported high-grade cyanide. They also assert that, in addition to its having equal efficiency on the basis of NaCN content, it contains a certain amount of calcium chloride, which accelerates the filtering process in gold and silver extraction. Preparations are being made to test the claims of the Canadian-made cyanide in the ore-treating laboratory of the Haileybury Mining School, under conditions practically identical with those existing at the Cobalt mills. The results will be compared with those of similar tests of high-grade cyanide manufactured in Scotland. The Cassel Cyanide Co., Ltd., of Glasgow, which since the cutting off of the German supply has furnished most of the cyanide used by the mining companies, will endeavor to strengthen its hold on the Canadian market by establishing a subsidiary company in Ontario, to be known as the Cassel Cyanide Co. of Canada, Ltd. This decision is the result of the recent visit to Canada of William Neill, managing director, who was strongly impressed with the opportunities presented for the expansion of the company's business in connection with the mining industry. Mr. Neill will be managing director of the Canadian company, and two of his colleagues, Sir George Beilby and Sir Edward Allen Brotherton, will also be on the directorate.

THETFORD, QUEBEC—July 26

In the Asbestos District of Quebec the business boom still continues. The demand is steady with little if any drop from war prices for crudes and long fibres. In the short grades there has been a decided slump in demand, but inasmuch as the profit lies mainly in the longer grades, general business conditions have not been noticeably affected. Labor has been decidedly stable, owing largely to the system of piecework adopted last season. By this system pit laborers average about $5 for an eight-hour day. The employees engaged in the concentrators are working on a varying scale of from $3.10 to $5 and are generally less inclined to labor agitation.

Construction work on the new ore-storage system of the B. C. Mines of the Asbestos Corporation of Canada is progressing and is expected to be in operation this fall. The capacity will be about 20,000 tons. It is intended to overcome the difficulty of slackened tonnage resulting from inclement weather as well as to secure a higher extraction due to better drying and curing. At the Jacob's mine considerable caving in has developed owing to the underground operations loosening up the sides of the old pits. The underground milling system is now practically complete, however, and is expected to afford a large production.

Steam-shovel mining has now been proved a success in the fibre-producing mines. At East Broughton this system of mining has been adopted at all the mines, and mining costs per ton have been cut in half. In the mines, however, where crudes have to be separated from the milling ore, it has not been found feasible to use the steam shovel. At the Black Lake Asbestos & Chrome Co., Black Lake, J. E. Murphy has resigned, and Milton, Hersey & Co., of Montreal, are acting as consulting engineers for the property. R. N. Palmer is acting as mine manager. Maurice Rousseau, of Montminy, purchased the Interstate Asbestos Co., at East Broughton, at a sheriff's sale on July 8.

VICTORIA, B. C.—July 17

British Columbia's Mineral Production in 1918, according to the annual report of the Minister of Mines, just issued, was derived from 2,892,849 tons of ore shipped, which came from 175 mines. Eighty mines shipped over 100 tons each during the year. In all, 4,148 men were employed on surface and underground. The total tonnage of ore produced came from the various districts of the province as follows: Cassiar-Omineca district, 963,260 tons; southern coast district, 745,169; Boundary-Yale district, 723,403; Slocan division, 142,700; East Kootenay district, 141,570; Train Creek division, 112,349; Ainsworth division, 44,937; Nelson division, 15,348, other mining divisions, 4,113, total 2,892,849 tons.

Production of the various metals was as follows: Gold (lode), approximately $3,403,812; gold (placer), approximately, $320,000; silver, 3,498,172 oz.; lead, 43,889,661 lb.; copper, 61,483,754 lb., and zinc 41,772,926 lb. Production of gold from placers decreased by $176,000, compared with 1917. Lode gold increased by $1,036,622. Silver increased by 568,956 oz.; lead by 6,592,196 lb.; and copper by 2,476,189 lb. The production of zinc decreased slightly.

Placer gold mining was confined almost entirely to the Atlin and Cariboo districts, which yielded 96 per cent of the total. As to hydraulic placer mining, from which about 90 per cent of the placer gold obtained in British Columbia is derived, it

has been well demonstrated that the gold output is in direct proportion to the number of days in which water is available for piping. The increase in the production of lode gold in 1918 is explained as largely due to the entry into the list of producers of the Surf Inlet property of the Belmont Surf Inlet Mines, which made an output of about 41,600 oz. The Slocan district led all other sections in the production of silver.

The production of lead increased in the Fort Steele, Slocan, and Windermere-Golden districts, and decreased in the Ainsworth and Nelson districts. The Sullivan mine of the Consolidated Mining & Smelting Co. of Canada is situated in the Fort Steele division. Usually it contributes nearly all of the division's output of lead, but in 1918 over 860,000 lb. came from the North Star mine. In regard to copper, the report mentions the large production of the Hidden Creek mines of the Granby Consolidated Mining, Smelting & Power Co., in the Skeena division, and of the Britannia mine in the southern coast district. The production of copper in 1918 according to districts was as follows: Skeena division, 30,190,606 lb.; southern coast district, 18,475,013; Boundary-Yale district, 9,940,125; Trail Creek division, 1,654,356; Omineca division, 643,843; all others, 579,811; total, 61,483,754 lb.

Zinc was produced in British Columbia in 1918 to the amount of 41,772,916 lb., compared with 41,848,513 lb. in 1917. The production of each district was as follows: Fort Steele, 26,704,806 lb.; Slocan 14,107,682; Omineca, 313,112; Ainsworth, 640,991; all others, 6,325; total, 41,772 916 lb. Thus an increase over 1917 is shown in the Fort Steele district of nearly 6,000,000 lb., which output came entirely from the Sullivan mines, the ore being treated in the electrolytic zinc plant at Trail. In the Slocan district the heaviest shipper was the Standard mine, with a production of over 7,000,000 lb.

MELBOURNE, AUSTRALIA—June 11

To Aid Prospecting in New South Wales, the Minister of Mines, on the recommendation of the prospecting board, has approved of an amended scheme. Although indications of minerals are at present less numerous than in the early days of mining, it is still reasonable to believe that there are valuable deposits undiscovered. It is proposed to supersede the old method of depending on casual discoveries by the adoption of a more scientific system under the direction of the government geologist. The granting of aid to promising sites under the present system has led to important discoveries, though in some instances the presence of minerals has been previously known. One notable result achieved under this system was the discovery of the value of the Mount Boppy mine, which, to the end of 1918 had produced gold valued at £1,686,815. Equipping and supporting of prospecting parties has been tried in this and other states, but with unsatisfactory results. The new proposal provides for two members of the geological staff to undertake the detailed examination of separate areas, mapping them as far as it is possible, to assist prospectors. It is also intended that the geological surveyor shall be given power to employ labor to assist in detailed examination as the work may require. This would provide that geological surveys and prospecting may be carried out simultaneously, and in addition to the information being obtained for use in subsequent mining operations, it would be available locally for the guidance of prospectors. In such cases assistance up to half the cost could be granted from the prospecting appropriation. Two areas which are considered to be suitable for work under these conditions include Eastern New England, in the northeast part of New South Wales, and the Girilambone-Cobar-Nymagee-Mount Hope district in the West. Parliament is being asked to increase the prospecting appropriation for the next financial year to £18,000. Consideration is also being given to the question of assisting in the erection of crushing plants and by moving batteries from worked-out fields and re-erecting them in other promising localities. This form of assistance has already been granted to a limited extent, and to provide for other removals a grant of £2,000 is being sought.

WAIHI, NEW ZEALAND—June 8

The Waihi Grand Junction Co. has purchased the property of the Waihi Extended Co. Apart from the value of the latter in respect to ventilation, there is always the possibility that further development of the newly acquired area will add to the Junction company's ore reserves. The general manager, Mr. Leah, stated that though improvement in ventilation was the main reason that had weighed with the management in making the purchase, the further exploration of the Extended mine would no doubt be made in due course. One of the first works in this direction to be undertaken would be on the Mary reef, which had yielded the Junction company a substantial tonnage of milling ore in two or three levels, and at one level had been worked close up to the old Extended company's boundary, with payable results.

THE MINING NEWS

Progress of Mining Operations Condensed and Classified for Easy Reference

ARIZONA

Cochise County

COPPER CHIEF (Johnson)—Overhauling machinery. Small force cleaning up underground. When fuel arrives work will start under new management. Martin Fishback, manager.

JOHNSON DEVELOPMENT (Johnson)—All work stopped while retimbering shaft.

Gila County

ARIZONA COMMERCIAL (Globe)—Produced 3,500,000 lb. copper in first six months of 1919, while operating at 60 per cent capacity. Development at depth progressing. Again sinking new shaft and opening up 15th and 16th levels. Ore for first half year averaged about 6 per cent copper. Company has practically continuous orebody from 7th to 15th level.

IRON CAP COPPER (Globe)—Superintendent reports mine in satisfactory condition. Shaft down to 1,300 level and drifting east on vein. Good grade of milling ore exposed. Company has accepted proposal of Inspiration Consolidated Copper Co. for concentrating and smelting Iron Cap ores as temporary measure. Construction program about complete, except for mill. No decision yet from Massachusetts Supreme Court whether it will retain jurisdiction in Arizona Commercial suit.

OLD DOMINION (Globe)—Development of eastern portion of property having satisfactory results. Running crosscuts every 200 ft. on some levels and every 100 ft. on others. Several promising orebodies cut, one being 80 ft. wide and 4-5 per cent copper. Company's mines producing about 1,800,000 lb. copper per month. Reserves increased in last few months by over 200,000 tons.

Graham County

GRAND REEF (Klondyke)—Shaft being unwatered to 3d level, where prospecting work will be done. Drifting and crosscutting on tunnel level with machine drills on contract. Property an old one recently taken over by Aravaipa Leasing Co., H. Hendrickson, superintendent.

SILVER COIN (Klondyke)—Old shaft retimbered. Station cut at 200 level and sinking started.

TEN STRIKE (Klondyke)—Contract let by Aravaipa Leasing Co. for all drifting, crosscutting, and sinking.

Pinal County

SILVER KING (Superior)—On July 22, new three-compartment shaft was down 170 ft., and being sunk at rate of 5 ft. per day. Mill treating 25 tons per day. During last week mill heads assayed from 16 to 23 oz. silver per ton; tailings assayed 1.0 to 1.2 oz. silver er ton, and assay value of flotation concentrates ranged from 1,000 to 1,980 oz. silver per ton. Last shipment of concentrates to smeltery assayed 1,375.2 oz. silver, 20.4 per cent lead, and 7.84 per cent copper. John Fowle, vice-president and general manager. Company considering erection of power plant near Superior, and 125-ton mill at mine. Company has opened and partially developed three new orebodies, overlooked by former operators, that lie outside of main chimney.

Yavapai County

SWASTIKA (Mayer)—Carload of ore recently shipped to Denever, where Dorr Co. made treatment test. Will install cyanide plant. F. W. Giroux, superintedent.

CALIFORNIA

Butte County

DONDERO (Yankee Hill)—Bond on property secured by E. R. Healy. Testing ground by keystone drill followed by decision to install dredge.

Calaveras County

BLAIR CONSOLIDATED (Angels Camp)—Sold to state several years ago for taxes and recently purchased from state by Burr Chambers at auction.

Kern County

RANDSBURG DIVIDE (Randsburg)—Owns twelve claims on which Williams and Kelly made rich silver discovery. Development continued to depth of 16 ft., with encouraging results. Some excitement in district.

Nevada County

EMPIRE (Grass Valley)—Work started on addition of twenty stamps to mill.

Sierra County

CLEVELAND (Sierra City)—New 20-stamp mill now running on free gold ore. Vein 28 ft. wide, R. G. Gillespie, Pittsburgh, Pa., owner; J. T. Kiel, manager; S. E. Montgomery, superintendent.

Yuba County

BLUE POINT (Smartville)—Gravel being worked by sluicing, as lack of tailings dam has made hydraulicking impracticable.

COLORADO

Boulder County

HUMBOLDT (Ward)—Being unwatered to 350 level, preparatory to resuming active development. Mine buildings under construction and new machinery will be installed. C. J. Walters, manager.

ROOK (Ward)—New shaft down 200 ft. A 7-ft. vein of silver-lead milling ore opened, containing stringers of high-grade silver ore. Property controlled by L. A. Ewing & Co. Ore will be treated at new White Raven mill, being constructed by Teal & Barr, of Boulder.

STRONG MILL (Ward)—Plant being remodeled by M. W. Loomis, and receiving ore from Puzzler mine, and from Ward-Columbia dumps.

Clear Creek County

PRINCE ALBERT (Lawson)—An 18-in. vein of payable silver ore opened in east heading at point 275 ft. from crosscut, and about 250 ft. below surface. In west heading, 3-ft. vein of low-grade milling ore opened. Property being developed by Matrix Mines Co.

Montrose County

RADIUM ORE SMELTING (Montrose)—Recent shipment of 36 tons of radium ore assayed 3 per cent uranium oxide. Plant has received over twenty cars of radium ore since starting few months ago. Average assay of material received between 1.5 and 2.5 per cent uranium oxide. Most of ore comes from Paradox Valley. Plant is only commercial radium ore sampler in existence. Large and small shippers send ore to plant to be sampled, assayed, pulverized, and shipped to Eastern market.

San Miguel County

PRIMOS CHEMICAL (Vanadium)—New steel mill under construction, to replace plant recently destroyed by fire.

IDAHO

Boundary County

IDAHO CONTINENTAL (Porthill)—Hauling ore by trucks begun. Two shifts employed in mine and three in mill.

Shoshone County

RICHMOND (Adair)—Crosscut from winze sunk from No. 3 tunnel shows vein 12 ft. wide, with from 2-6 in. of high-grade copper. Will drift 1,000 ft. on this level, at depth of about 600 ft.

CARBONATE HILL (Mullan)—Crosscut from shaft at 400 ft. failed to uncover orebody. Ground being prospected with diamond drill.

NATIONAL (Mullan)—Mill shut down. Work in mine confined to development on and above main working tunnel. Ore copper, but crosscut being run that may uncover body of lead ore. Original discovery lead, combined with little copper. Indications that vein split at depth of 400 ft. and that present copper vein is offshoot from main fissure.

INTERSTATE-CALLAHAN (Wallace)—Putting on men as fast as they apply. Management expects to be in full operation soon after Aug. 1.

MICHIGAN

Copper District

COPPER RANGE (Painesdale)—Champion hoisting practically no waste rock to surface. Using it underground for backfilling. Sand-filling plan in vogue last year discontinued, on account of high freight rates and labor costs. Rock for last three months averaged over 37 lb. copper per ton. Mine richest lode producer in district. Baltic second in point of richness. Trimountain improving, averaging 28 lb. per ton, compared with 26.52 in 1918. All mines short of underground men.

Gogebic Range

NEWPORT (Ironwood)—Twentieth level of Woodbury shaft now connected with Bonnie shaft. Ore can be hoisted at latter while engines at former are being leveled.

OLIVER IRON (Ironwood)—Planning erection of fifty houses for miners, twenty-five at Puritan mine and twenty-five at Davis mine. Houses will be six-room, of frame construction, with full concrete foundation and half-basement, and about 20 x 27 ft.

TOWNSITE (Ironwood)—One stockpile of over 25,000 tons already shipped. Shovel now loading second-grade stockpile. Shipments for season expected to exceed 80,000 tons. Ore taken from ground which was worked over from Norrie shafts years ago.

MINNESOTA

Cuyuna Range

STRIPPING OPERATIONS progressing at Gordon and Sagamore. Work at Gordon by Coates & Tweed. Will be ready for shipments this season. Two drag lines at work at Sagamore, being stripped under contract by Winston, Dear & Co. for John A. Savage & Co. Work hindered by water, now under control. Expect to ship 100,000 tons manganiferous ore this season.

CROFT (Crosby)—Mining 800 tons per day, heaviest production ever recorded. Will start soon to sink 150 ft. deeper. Steel shaft sets bought and at property.

NORTHLAND (Cuyuna)—Hoisting and stocking manganiferous ore from underground development.

ARKO (Ironton)—Working with reduced forces and developing underground. Grading for spur track. Reported to have sold 25,000 tons of manganiferous ore.

HILLCREST (Ironton)—Shipping ore from pit. Some hydraulic stripping being done, as shown in photograph on this page. Property operated by Coates & Tweed, who are stripping Portsmouth mine by steam shovel. Wilbur Van Evera is manager.

HOPKINS (Ironton)—Breitung & Co. property shipped 7,000-ton stockpile of manganiferous ore. Mine still closed down.

WHITMARSH (Ironton) — Developing Martin and Huntington mines and stocking manganiferous ore. Properties rapidly preparing for heavy production.

MISSOURI

Joplin-Miami District

CULBERT (Joplin)—Taken over by B. M. Inman and associates, who have dewatered and again put in operation.

MONTANA

Beaverhead County

BOSTON & MONTANA DEV. (Wise River)—Third raise from 1,000 level of Idanha to 900 level shows seven feet commercial ore. Montana Southern Ry., subsidiary, has steel laid beyond Wise River, with about twelve miles of rail laying required to reach Elkhorn mines. Roadbed completed.

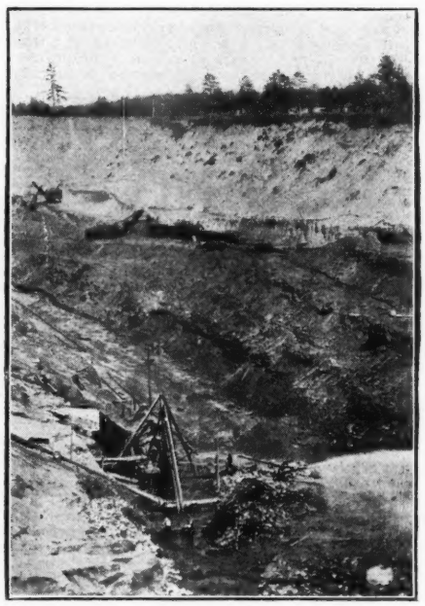
Missoula County

POTOMAC COPPER (Potomac) — Foundation laid for miners' boarding house. Will drive tunnel below old Copper Cliff to depth of 800 ft. below Cliff and 1,200 below Leonard claims. Ore zone 30 ft. wide indicated in Leonard property.

Silver Bow County

ANACONDA (Butte) — Engineers of Boston & Montana works at Great Falls have produced desirable carbide product in ferromanganese plant. Company has not investigated commercial feature of venture. Great Falls zinc plant shut down because of large stock of metal on hand. Ore production about 55 per cent normal, water scarcity interfering with return to capacity at Washoe Reduction Works. Twenty Cottrell smoke treaters now in operation at Washoe works. Last treater recently put in use.

BUTTE - BULLWHACKER (Butte) — Operations resumed, and ore shipments will begin soon to leaching plant of Anaconda company.



PIT OF HILLCREST MINE, IRONTON, MINN., ON CUYUNA RANGE. HYDRAULIC STRIPPING OPERATIONS IN FOREGROUND

BUTTE & SUPERIOR (Butte)—Sinking of No. 2 shaft to start soon. Hayden-Stone interests, back of Butte & Superior, have taken options on territory adjoining Davis-Daly on south and will sink two large shafts and develop ground traversed by fissures of latter. Planned to acquire about 200 acres.

DAVIS-DALY (Butte) — Orebody at Colorado mine opened for length of 1,200 ft., with ore still in evidence. One of longest shoots in district. Colorado shaft down more than 2,630 ft., with 2,700 as objective.

NORTH BUTTE (Butte)—Crosscut south 100 ft. on 900 level of Sarsfield shaft on east side shows ore zone around 40 ft. wide, with copper content unknown, local office refusing to disclose assays. Five old levels being opened at Speculator mine. Large tonnage of second class ore blocked out ready for mining. Copper production for July will show increase over June.

TUOLUMNE COPPER (Butte)—Fifteen-inch stringer of good grade of silver ore cut by crosscut being driven on 1,000 level for Spread Delight fissure. Shaft down about 1,060 ft., with 1,200 as objective.

NEVADA

Elko County

HOLDEN MINING (Tuscarora)—Fifty-ton mill being erected and will be running soon, according to C. C. Griggs, general manager.

Mineral County

CANDELARIA MINES (Mina)—Charles D. Kaeding, vice-president and manager of Candelaria Mines Co., and R. C. Warriner, consulting engineer for Crown Mines in Canada and a director of Candelaria company, left Reno on July 22 for Candelaria. Plans for extensive operations being considered.

CONS. WEST EXT. SIMON (Mina)—Machinery installed and shaft being sunk on cropping 70 ft. wide, adjoining Simon Silver-Lead. Company well financed. G. F. Thompson, general manager.

SIMON SILVER-LEAD (Mina)—Drifts on vein at 400 level out 150 ft. each way from crosscut. New machinery en route to mine includes 60-hp. gasoline hoist, 100-hp. engine for generator, and 120-hp. duplex Western gas engine for 700-cu.ft. Sullivan compressor.

Pershing County

PLAINVIEW (Rochester)—Charles Moran, president of Nevada, California & Oregon Ry., has joined C. N. Miller in development of Plainview mine at Rochester. Former visited mine on June 19. Mine has 40,000 tons $12 ore developed.

ROCHESTER NEVADA SILVER (Rochester)—Charles D. Kaeding, consulting engineer, C. A. Bennett, superintendent, have worked out system of faulting on 900 level. Gross output of mill about $60,000 per month.

Nye County

FLORENCE DIVIDE (Divide)—Shipping seven carloads from lease on Florence at Goldfield, which management says will average $100 per ton. Shipment of high-grade ore has also been made.

KNOX DIVIDE (Divide)—Opening up new vein which assayed 80c. on surface. At 8-ft. depth vein is 6 ft. wide and samples from $30 to $60 per ton.

REVERT DIVIDE (Divide)—New vein 2 ft. wide struck in crosscut on 300 level. Has widened to 4 ft. in drift.

SPANISH BELT (Manhattan) — Company has bought 10-stamp mill, which will be erected soon.

WHITE CAPS (Manhattan) — Changes being made in mill which are expected to result in much better saving.

WILLOW CREEK GOLD (Nyala) — Fred H. Vahrenkamp and Dr. Edward Bowes have secured control of Willow Creek mine. High-grade free gold ore developed to 220-ft. depth.

DIVIDE EXTENSION (Tonopah) — Crosscut on 100 level, Caldwell shaft, in vein 21 ft. without reaching hanging wall. Officially announced that ore is all high-grade and that first 12 ft. averages $197 per ton.

RESCUE EULA (Tonopah)—Opened up new orebody 14 ft. wide on 1,050 level. Ore averages better than $20 per ton.

STONE CABIN (Tonopah)—Edmond B. Bronson, president Calavada Copper Co., (Luning, Nev.) and Arizona Bagdad, (near Hillside, Ariz.), has bought Buckhorn group at Stone Cabin and is installing complete plant of machinery. Vein 35 ft. wide, with stringers of high grade.

TONOPAH BELMONT (Tonopah)—Net profits for June from 8,647 dry tons milled, $54,194, as compared with $56,408 for May.

TONOPAH DIVIDE (Tonopah)—Crosscut on 580 level shows vein 35 ft. wide. Face of southeast drift 80 ft. from crosscut in rich ore.

TONOPAH EXTENSION (Tonopah) — Clean-up of mill for first half of July valued at $48,470.

TONOPAH MINING (Tonopah)—Net profits for June from 4,687 dry tons milled, $39,000, as compared with $29,200 for May.

NEW MEXICO

Grant County

EMPIRE ZINC (Hanover)—Doing development work only.

HANOVER-BESSEMER I. & C. (Hanover)—Shipping steadily, rearranging mill. E. Barnes, superintendent.

LAST CHANCE (Lordsburg)—Shipped car silver concentrates July 21 to El Paso smeltery. Value approximately $25,000. B. Prescott, superintendent.

BLACK HAWK CON. (Silver City)—Increasing working force as men can be secured. Will deepen old shaft. C. B. Lidstone, superintendent.

KING & QUEEN (Steins Pass)—Pushing development. Sinking new shaft, building concrete warehouse and office building. F. H. Perry, superintendent.

BURRO MOUNTAIN (Tyrone)—Putting new concrete floor in mill. Entire new equipment will be installed. Development work in progress.

LEACH-SNELLY-CASEY (Tyrone)—Have consolidated 32 claims around old Blackhawk-Rose and Alhambra silver mines in Blackhawk district, working small force.

Otero County

ORO IRON (Ohaysi)—James H. Parker, manager, recently in El Paso, looking for Mexican miners.

Sierra County

MOFFITT CONSOLIDATED COPPER (Kingston)—Shipping silver ore to El Paso smeltery from old Virginia silver mine on North Percha Creek, in Black Range mining district. Company has acquired several copper claims west of Caballo Mountain, twenty miles south of Elephant Butte dam.

Socorro County

MOGOLLON MINES (Mogollon)—Operating and shipping steadily. Sidney J. Kidder, manager.

SOCORRO M. & M. (Mogollon)—Property still shut down. Everything ready to start pending court decision. E. Scott, receiver.

OKLAHOMA

Joplin-Miami District

UNDERWRITERS (Douthat)—Starting two new shafts on Lucky Extension lease, which they have been testing by drilling.

HUTTIG (Joplin)—Planning removal of Inspiration mill, which it owns, from north of Blue Mound mine, to Saturn mine, northwest of Picher.

LARSH (Picher)—Renewing operations after several months' shutdown because of low ore prices.

LEAD BOY (Sunnyside)—Taken over by W. R. Womack and C. M. Evans, of Picher, who have again started mill.

TEXAS

Brazoria County

WEST COLUMBIA PRODUCTION for week preceding July 17 was 22,250 bbl. oil per day. Producing companies: Humble Oil & Refining, 9,005 bbl.; Crown Oil & Refining, 5,600; Texas Co., 5,158; Gulf Production, 2,530; and Hannicker, 35. Reported 24 wells in field producing and 5 shut off for various reasons; drilling on 3 new wells started.

CROWN OIL & REFINING (West Columbia)—No. 3 Olschewski well brought in recently increasing in flow. No. 3 Marmion, recently completed, good producer.

HUMBLE OIL & REFINING (West Columbia)—Started flowing oil through new pipe line to Webster tank farm, where 12 tanks of 55,000-bbl. capacity each are being built, three being completed. Pipe line being constructed from tank farm to Texas City, where docks from which 100,000-bbl. tank steamers can be loaded will be built.

Dallas County

LONE STAR GAS (Dallas)—Capitalization increased to $10,000,000. Will engage in oil business on large scale. Construction of pipe line from West Texas fields to serve North Texas cities with gas begun; estimated cost $5,000,000. Company controls 50,000 acres in producing fields of West Texas and 30,000 acres in Oklahoma fields. Now drilling 35 wells, and has four producing oil wells.

Harris County

GULF PRODUCTION (Goose Creek)—No. 16 Stateline well completed July 11 making good production of clear oil.

BRAZOS OIL & REFINING (Humble)—Small well brought in on Falvey lease.

GAMBLER OIL (Pierce Junction)—No. 1 Mowry well junked; moving to new location at Cross Timbers.

Jefferson County

GULF CO. (Beaumont)—McFadden No. 2 well drilled at rate of 100 ft. a day for 23 days; now in hard rock and progress slow. This well of importance, being in Spindle Top extension field near McFadden No. 1 well, brought in several months ago, which began flowing at 2,900 ft.

TEXAS CO. (Beaumont)—No. 1 Fee well down 500 ft. Well within 100 ft. of McFadden No. 1 well, a producer of Gulf Co.

Liberty County

HOUSE CO. (Dayton)—No. 2 Zeiss & Pickett well south of Dayton started drilling. Interesting in that it is 1,000 ft. off salt dome.

SIMMS CO. (Dayton)—No. 1 Peterson well, northwest of town, abandoned at 1,010 ft.; rig moved and new well started.

REPUBLIC PRODUCTION (Hull)—No. 20 Dolbear well brought in July 17 flowing strongly from 2,400 ft.

Limestone County

DEEP DRILLING will be done near Mexia, where four wells will be put down; drilling on two now under way. No drilling previously in old field below gas sand that averages 700 ft. deep. Leases in demand.

Runnels County

GULF PRODUCTION (Ballinger)—Russell No. 2 well spudded in, and drilling progressing satisfactorily. Gas from Russell No. 1 well used as fuel.

SINCLAIR GULF (Ballinger)—Down 2,300 ft. in dry hole one and one-half miles east of Russell No. 1 well. Log of latter showed oil in three places, but when shot, after drilling to 3,500 ft., no oil found.

UTAH

Juab County

TINTIC SHIPMENTS week ended July 19 amounted to 129 cars.

EUREKA BULLION (Eureka)—New compressor installed and water-line approaching completion. Raising and sinking on ore recently opened on 800 level. Will drift from raise. With new equipment shaft will be sunk below 800 level, where larger bodies are looked for. Company has 210,000 shares in treasury, and $12,000 cash on hand.

INDEPENDENCE (Eureka)—Stock of company to be listed. Claims east of Copper Leaf, in East Tintic district. Shaft to be sunk. Alex. G. Matson interested.

PLUTUS (Eureka)—Connection being made with Chief Consolidated ground from 1,000 level. Face of drift about 370 ft. from new Chief Consolidated shaft, now down 600 ft. Winze 300 ft. below 1,000 level has cut mineralized quartz.

TINTIC STANDARD (Eureka)—Shipping about two cars daily. New hoist to go into operation soon.

ZUMA (Eureka)—Annual stockholders' meeting held and old officers re-elected. Property in East Tintic.

Salt Lake County

EMMA SILVER (Alta)—Articles of incorporation filed, indebtedness cleared off, and $100,000 in treasury. Capitalization 5,000,000 shares, par value $1, with 1,000,000 shares in treasury. Officers: C. S. Burton, president; John Dern, vice-president; F. B. Cook, secretary and treasurer; J. E. Galigher, J. M. Hayes and A. L. Hoppaugh. Estimated to have machinery worth $250,000. In early days produced $2,637,227, and sold to English syndicate for large sum, soon after which ore lost through faulting. Large development campaign undertaken in 1915 by Eastern interests. A total of $280,000 worth of ore was shipped. Company went into receivership, present reorganization following, with Utah men interested.

MONTANA-BINGHAM (Bingham Canyon)—Annual stockholders' meeting held July 21 and board of directors elected: C. G. Ballantyne, president; E. A. Vail, J. B. Mossman, J. Benton Leggatt, W. E. Hubbard, Imer Pett, Lewis B. McCornick. In future, annual meeting will be held first Tuesday in March. Producing two cars of ore weekly from development. Strike of higher-grade copper ore holding out.

UTAH COPPER (Bingham Canyon)—Understood there is prospect of mine and mills being worked again at full force in near future, owing to rising price of copper.

CARDIFF (Salt Lake City)—Employing about seventy miners. Ore being brought down Big Cottonwood Canyon in trucks at rate of 60 to 70 tons a day.

TAR BABY (Salt Lake City)—Six men working. J. A. Little, superintendent. Tunnel being driven to cut "Cardiff" contact.

Summit County

PARK CITY SHIPMENTS week ended July 19 totaled 2,393,710 lb., shippers being Silver King Coalition, Judge Mining & Smelting, and Daly West.

Piute County

MINERAL PRODUCTS (Marysvale)—Reported work resumed after shutdown of several months. Alunite property equipped with large mill producing potash.

Utah County

SILVER BELL (American Fork)—Lessees at this property near Bellerophon shipped car of silver-lead ore from surface workings.

WASHINGTON

Ferry County

BEN TILLMAN (Republic)—Property leased and will be developed. Owned in London, England.

LONE PINE-SURPRISE (Republic)—Shipping 50 tons daily from Last Chance mine.

QUILP (Republic)—Surprise shaft down 800 ft., and ore followed 200 ft. on that level. Quilp shaft will be unwatered and extended to connect with drift on 800 level. W. G. C. Ianskall, manager.

WISCONSIN

Zinc-Lead District

GEYER LAND (Cuba City)—Loeffelholz Bros. report good strike of zinc ore on Geyer land near Cuba City.

SMITH-RULE TRACT (Linden)—Joe Piquett and Sam Altenberg developing this lease north of Optimo No. 4 at Linden. Property proved by fifty drill holes and shaft showing high-grade disseminated blende. Foundations laid last autumn for 100-ton-mill. Negotiations now under way to provide mill equipment.

KISTLER & STEPHENS (Platteville)—Lease obtained on Rowe tract, adjoining Rodham mine, at Shullsburg. Property formerly known as Rowe, also as Milwaukee-Shullsburg, also as Brown-Croft. Appeared promising when mill was destroyed by fire four years ago.

ZINC HILL (Platteville)—Big Dick shaft down to ore on Harvey lease at Cuba City, and rich sheet blende encountered.

CANADA

British Columbia

CORK-PROVINCE (Slocan)—Reorganization decided upon at annual meeting, and 1,250,000 shares of dollar stock will be issued to take place of 8,500,000 shares of 10c. stock. This will make some stock available for development. Will refire bonds of $16,250. Extension of workings decided upon.

QUEEN (Slocan)—Examined and surveyed by Carl H. Hand, of Los Angeles, for A. W. McClune, of Salt Lake City.

Manitoba

BROOKLYN—(Rice Lake)—Shaft down 70 ft. Drifting will be done when 100 level is reached. A. L. Anderson in charge.

Ontario

PETERSON LAKE (Cobalt)—Offering 400,000 shares of treasury stock to shareholders at 15c. per share to raise $50,000 for further development.

ALLIED GOLD MINES (Boston Creek)—Company, which was organized to take over O'Donald and Cullen-Renaud claims, and secured options on those properties, also owned three other undeveloped claims. Latter allowed to revert to government for non-performance of assessment work. Claims restaked by D. Belec. Litigation followed, and matter finally compromised by company paying Belec $500 and having claims reinstated.

CHARETTE (Boston Creek)—Shaft down 60 ft. Vein 60 ft. wide showing low gold content being followed.

MURRAY-MOWGRIDGE (Bourkes Siding)—New vein 4 ft. wide encountered.

AGAUNICO—(Bucke Township)—Large vein of cobalt mineral, explored some years ago for silver, on passing from conglomerate into Keewatin formation found to contain high gold content.

BERRY (Kirkland Lake)—Claim L 1,535, one of group of five locations known as Berry claims, situated south of Burnside, purchased by Buffalo interests.

MATACHEWAN RAND (Matachewan)—Large vein of chloritic schist and quartz uncovered. Contract for 15,000 ft. of diamond drilling placed.

CLIFTON (Porcupine)—Installation of mining plant completed. Drifting being carried on at first level on downward extenson of oreshoot showing on surface, which shows high-grade ore for 25 ft.

SULLIVAN (Seskinika)—Being explored by diamond drilling.

HOLLINGER CONSOLIDATED (Timmins)—Machinery being installed for addition to mill, which will increase capacity to daily tonnage of 3,500 tons.

Quebec

BLACK LAKE ASBESTOS & CHROME (Black Lake)—U. S. Steel Corporation has secured option until Aug. 22 on chrome iron ore lands of company. Steel company's engineer has made inspection of properties and reported to principals.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices, Metal Market Conditions, Average Monthly Prices, Stock Quotations

Silver and Sterling Exchange

July	Sterling Exchange	Silver: New York, Cents	Silver: London, Pence	July	Sterling Exchange	Silver: New York, Cents	Silver: London, Pence
24	439	107¼	54⅞	28	435½	107	55 3/16
25	439½	107¾	55 1/16	29	437	107½	55¼
26	434½	106½	55 1/16	30	435	107	55 5/16

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Daily Prices of Metals in New York

July	Copper: Electrolytic	Tin: Spot	Lead: N. Y.	Lead: St. L.	Zinc: St. L.
24	22.85@23.35	68	5⅜@6	5.50@5.75	7.90 @7.95
25	22.85@23.35	68	5⅜@6	5¾	7.80 @7.90
26	22.85@23.35	68	5⅜@6	5¾	7.70 @7.80
28	22.85@23.35	68	5.85@6	5.65@5.70	7.70 @7.80
29	22.85@23.35	68	5.80@6	5.60@5.65	7.60 @7.65
30	22.85@23.35	68	5.80@6	5.60@5.65	7.50 @7.60

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

July	Copper: Standard Spot	Copper: Standard 3 M.	Copper: Electrolytic	Tin: Spot	Tin: 3M.	Lead: Spot	Lead: 3 M.	Zinc: Spot	Zinc: 3 M
24	106	106½	110	256¼	255½	23⅝	24⅛	43⅛	43¾
25	106	106½	110	260	258½	23¾	24⅝	43¼	43¾
26	...	...	...	...	...	...	...	...	...
28	107¼	107½	110	268	266	24	24⅝	42¾	43¾
29	107	107½	110	270	267	24	24⅝	42½	43½
30	105	110	110	268	266½	24	24⅝	41½	42½

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Metal Markets

New York—July 30, 1919

The quotations for copper on July 19 and 22 were erroneously printed last week as 22.35@23.90 and 22.85@23.90, respectively. These figures are corrected to 22.35@22.85 for July 19, and 22.85@23.35 for July 22, which figures will be used in computing the July average.

During the last week the metal markets were very dull and were inclined to softness, which exhibited itself especially in zinc. For the moment, buying power seems to have exhausted itself. Japan, which has been so influential a factor, seems to have satisfied its immediate requirements. The Japanese buying during the last few months has run to large figures in the aggregate, not only for copper, but also for zinc and lead. Besides its purchases in this country, Japan has also bought in England.

Transatlantic freight rates are $18 to British ports and $20 to French, Belgian and Dutch ports. Freights from San Francisco to Hongkong and Kobe declined to $12.

On July 24 an agreement was signed in London by the Bank of England and representatives of South African gold-mining companies, removing the restrictions on the export of gold that prevailed during the war. Thus a free market for gold produced in the Transvaal is established, and it is now possible for gold to be purchased in England through the usual channels for shipment abroad, enabling the Transvaal producers to sell their gold in the best market, which will place them in a more advantageous position to meet the rising costs of production.

As an experimental sale, 50,000 oz. of gold has been shipped to the United States at a price of about 85s. 6d. per standard ounce, which represents a premium of approximately 10 per cent compared with the 77s. 9d. obtained by these companies hitherto.

Copper

With the end of our last week of record the vigorous buying of copper ceased, and this week sales by producers were relatively small. The excitement of the previous week, during which extravagant prices were paid for some small lots of copper for forward delivery, passed away. With the absence of any strong demand, and the feeling in some quarters that the market might have topped, speculative interests undertook to realize, and there was rather free offering of copper for resale at concessions from ¼ to ½c. per lb. below the price—23½c., delivered, equivalent to 23.35c., cash, New York—that was firmly asked by the principal producers for August-September delivery.

Copper Sheets—The base price of copper sheets is 33½c. per lb. Demand strong. Copper wire is quoted at 26@26½c. in carload lots, f.o.b. mill. Market not very strong, but producers are holding firm. Considerable second-hand copper on the market is causing a sag in the price.

Tin

Prices for American tin remained unchanged at 70c. for electrolytic and 68c. for 99 per cent grade. Small business was done in Straits tin, on the spot, at 70c. July shipments from the Straits were quoted at 53½c. at the close. The War Trade Board Section of the Department of State announced under date of July 24 that WTB R-799, issued July 2, 1919, has been amended so as to advance from Sept. 1, 1919, to Aug. 15, 1919, the date on and after which pig tin and all metal alloys containing tin, including tin drosses, tin oxides, solder drosses, type metals, anti-friction metals, waste metals, and other metals containing tin may be imported from points other than points of origin and without reference to the date of shipment.

Pursuant to the above-mentioned amendment, on and after Aug. 15, 1919, pig tin and all metal alloys containing tin, including tin drosses, tin oxides, solder drosses, type metals, anti-friction metals, waste metals, and other metals containing tin, will be permitted to be imported into the United States under General Import License PBF-37.

Lead

The big demand last week led the A. S. & R. Co. to advance its price to 6c. on July 24, sales having been made previously on that day by other producers at 5.75c. While the principal seller consummated transactions at the new price, the figure was regarded in other quarters as being excessive, and was shaded right from the start. As the week wore on and it became more and more difficult to make sales, the concessions that were offered became sharper, and at the close lead was easily obtainable at 5.80c., New York.

On the recent advance the producers of Mexican lead made good sales of their product and have put themselves in a comfortable position.

Zinc

On the way up from 7¾@8c. some very large business was done, and apparently buyers were loaded with all that they could carry for a while. Anyhow, demand ceased sharply at the beginning of this week, and that, together with the news that the Government was going to dispose of its stock of zinc in its own way, threw a shadow over the market, and zinc immediately began to be offered at concessions, and declined sharply from day to day on small business.

During the advance to 8c. for Prime Western zinc, high-grade rose to 9c. The demand for high-grade during the last week, however, was insignificant. On the other hand, zinc dust was in good demand at 12@12½c. for high-grade, and at about 11c. for ordinary prolong dust.

The negotiations between the Government and the zinc smelters, acting through the American Zinc Institute, for the disposition of the Government's stock of zinc, have ended, the office of the Director of Sales of the War Department having decided to sell its holdings in its own way. On July 16 the following memorandum, covering the proposed terms, was issued:

> The current market price of Prime Western at East St. Louis to be the base price, to which should be added the following amounts:
>
> (a) Carload rate of freight from East St. Louis to point of delivery.
>
> (b) Add for Grade A, 50c. per cwt. Add for Grade B, 37½c. per cwt. Add for Grade C, 10c. per cwt. Grade D, same as Prime Western.
>
> Prices other than above shall first be approved by the Raw Materials and Scrap Section.
>
> (c) Carload rate of freight will be allowed from present location to point of delivery, provided the delivery point is the nearest available to the Government stocks.
>
> Whenever possible, material shall be sold to the contractor at whose plant the material is located.
>
> Material on which the Government is now paying storage or other charges shall be the first to be sold.

It is understood that the Government stocks have already been reduced materially, and what remains consists principally of high-grade zinc.

Our recent advices from Belgium are to the effect that a great scarcity of zinc ore exists, owing chiefly to the unfavorable conditions of freight. The smelters who possess their own mines will probably receive supplies and start smelting soon, but those smelters who used to rely chiefly on Australian ore will be a long time in getting in operation upon any considerable scale. It is estimated that the present cost of production by Belgian smelters will be from 1,000 to 1,100 fr. per ton, while American sellers have intimated a price of about 850 fr. for their product. However, German producers who have accumulations of zinc to sell are endeavoring to export it, and that competition must be met.

Zinc Sheets—The quoted price of zinc sheets is $10 per 100 pounds.

Other Metals

Aluminum—Virgin metal quoted at 33c. per lb. No change. Market quiet. Future outlook encouraging.

Antimony—The market continued strong. We quote at 9¼@9½c. Few offerings of futures were made.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.10 per lb. for wholesale lots—500 lb. and over. No change.

Cadmium—Quoted at $1.50 per lb. in lots of 500 pounds. For lots under 200 pounds, $1.75 per lb. No business being transacted. No change.

Nickel—Ingot, 41c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Prompt supplies have become very scarce in this market, with the result of a further rise in price. We quote $109. Prospect of a further advance is contemplated in the trade. San Francisco telegraphs $103, strong.

Silver and Platinum

Silver—Silver has ruled steady in London, with an advancing tendency, closing at 55 5/16d. The New York market has been fairly firm, depending on sterling exchange rates, which have been stronger the last week. The buying has been largely for China account, and the market closes firm on continued demand from this quarter.

Mexican dollars at New York: July 24, 83; July 25, 83⅜; July 26, 82⅝; July 28, 82¾; July 29, 83⅛; July 30, 82⅜.

Platinum—Market steady. We quote $105 for refined ingot. No change.

Palladium—Quiet at $120.

Zinc and Lead Ore Markets

Joplin, Mo., July 26—Zinc blende, per ton, high, $57.40; basis 60 per cent zinc, premium, $55; Prime Western, $55@$52.50; fines and slimes, $50@$47.50; calamine, basis 40 per cent zinc, $32@$30. Average settling prices: Blende, $53.71; calamine, $30.55; all zinc ores, $53.20.

Lead, high, $65.15; basis 80 per cent lead, $65; average settling price, all grades of lead, $53.48 per ton.

Shipments the week: Blende, 9,383; calamine, 210; lead, 1,352 tons. Value, all ores the week, $582,650.

Shipments seven months: Blende, 303,226; calamine, 8,390; lead, 43,189 tons. Value, all ores seven months, $15,094,200.

Owing to some low-grade lead being marketed, the average price was less than last week. Though buying was tentatively $55 basis, and one buyer secured a large tonnage on that base, other buyers received withdrawal orders this morning before contracting the week's orders. A few sellers were offering ore at $52.50 tonight, and no takers.

Patteville, Wis., July 28—Blende, basis 60 per cent zinc, $53.50 per ton base for premium grade, and $51 base for high lead or Prime Western grade. Lead ore, basis 80 per cent lead, $67 per ton. Shipments reported for the week are 1,560 tons blende, 95 tons galena, and 381 tons sulphur ore. For the year to date the totals are 57,281 tons blende, 3,296 tons galena, and 8,517 tons sulphur ore. During the week 3,487 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Unchanged at $25 per ton, f.o.b., California points, for ore running 40 per cent or better.

Manganese Ore—Sellers ask 60c. per unit, and buyers are willing to pay 50c. for metallurgical ore.

Molybdenum Ore—Small business was reported at 85c. per lb.

Other Minerals

Nitrate—Practically no change has occurred, except that the market in Chile has become firmer. The government is still liquidating its stocks. Price is quoted at $2.95 per cwt., carload lots, for immediate shipment.

Pyrites—Spanish pyrites is quoted at 17½c. per unit for furnace ore, c.i.f., New York or other Atlantic port. Market slow and unsettled; hand-to-mouth buying. Price will decrease with ocean freights.

Sulphur—Conditions remain unchanged, price being quoted at $18 per ton, carload lots, domestic delivery, and $20 for export, at mines in Freeport, Tex., and Sulphur Mine, La. The basis of the foreign demand is the labor shortage in the Sicily mines, which, it is predicted, will not be able to attain a normal production for about one year's time; so the prospects of continuation of the present brisk export trade of the United States appear promising for that period. Domestic business is good.

Iron Trade Review

Pittsburgh—July 29

There has been a slight further increase in demand for some forms of steel production, but the demand continues to be poorly distributed as to products, and consequently the finishing departments, which are well filled with orders, are offered the most business, and departments that need business are getting no more than formerly. Easily the greatest gap in the market is that made by the absence of railroad buying. Though some observers are so sanguine that they refer to the possibility of the steel industry being filled to capacity with orders be-

fore the railroads come into the market, there are not many of that sort. Another laggard has been large construction work, involving the use of fabricated structural steel, but this line is picking up at a fair rate. An interesting point is that nearly all the fabricated steel work now bid upon is actually let, a comparison of recent bidding showing a proportion of 80 or 85 per cent let of all work bid upon, this being a high percentage for ordinary times. Last spring there was much bidding, with scarcely any contracts let.

The whole steel situation, viewed at long range, shows a wide difference in the rates at which the various activities that consume steel have been returning to normal. The automobile trade was the first to recover; railroad buying will be the last class of activity to develop. The comparison can be made in detail. In the sheet trade, for instance, the first heavy demand came from the automobile industry, and the last class of sheet buying to develop has been in sheets for building purposes, including sheets for making metal lath. The cold-drawn steel makers are busy on shafting and screw stock in small sizes, demand being moderately heavy up to 3-in. sections. Departments making above 3-in. are not operating at more than 50 per cent.

Steel mills as a whole are operating at a trifle more than 70 per cent. of capacity, this representing a slight increase since the first of the month. The steel market shows little excitement, perhaps because this is the middle of the midsummer period, usually a dull one.

Pig Iron—There is a moderate flow of pig-iron business for early deliveries and fourth quarter, with only occasional and slight price irregularities. The course of prices in the next few months depends largely upon whether idle furnaces hasten to get into blast or wait until they are certain of securing present or advanced prices. The Valley market is quotable firm as follows: Bessemer, $27.95; basic, $25.75; foundry, $26.75; forge, $25.75, f.o.b. Valley furnaces, with $1.40 freight to Pittsburgh.

Steel—There is heavy demand for sheet bars, most of the tonnage being placed with the consumers' regular sources of supply, but an occasional general market inquiry appears, such as that of a Wheeling consumer for 3,000 tons, for rolling into sheets. Rolling billet inquiries seldom appear in the market, but there is now a little demand for forging billets. We quote: Billets, $38.50; sheet bars and small billets, $42; slabs, $41; rods, $52.

Ferromanganese—Inquiry for ferromanganese is light, but any important inquiry is likely to produce open competition. British producers have reduced their price $10, and nominal asking prices for 80 per cent are now $115, delivered, for domestic, and $105, c.i.f., for English.

MONTHLY AVERAGE PRICES OF METALS

Silver

	New York			London		
	1917	1918	1919	1917	1918	1919
Jan.	75.630	88.702	101.125	36.682	44.356	48.438
Feb.	77.585	85.716	101.125	37.742	42.792	48.027
Mar.	73.861	88.082	101.125	36.410	43.620	48.171
April	73.875	95.346	101.125	36.963	47.215	48.886
May	74.745	99.505	107.135	37.940	48.980	52.104
June	76.971	99.500	110.430	39.065	48.875	53.896
July	79.010	99.625	.....	40.110	48.813	.....
Aug.	85.407	100.292	.....	43.418	49.077	.....
Sept.	100.740	101.125	.....	50.920	49.500	.....
Oct.	87.332	101.125	.....	44.324	49.500	.....
Nov.	85.891	101.125	.....	43.584	48.969	.....
Dec.	85.960	101.125	.....	43.052	48.492	.....
Year	81.417	96.772	.....	40.851	47.516	.....

New York quotations cents per ounce troy, 999 fine London, pence per ounce, sterling silver, 925 fine.

Copper

	New York		London			
	Electrolytic		Standard		Electrolytic	
	1918	1919	1918	1919	1918	1919
Jan.	23.500	(a)	110.000	92.238	125.000	106.619
Feb.	23.500	16.763	110.000	78.700	125.000	95.700
Mar.	23.500	14.856	110.000	76.821	125.000	82.071
April	23.500	15.246	110.000	77.300	125.000	82.200
May	23.500	15.864	110.000	77.767	125.000	81.227
June	23.500	17.610	110.000	83.062	125.000	85.900
July	25.904	.....	119.913	.....	134.913	.....
Aug.	26.000	.....	122.000	.....	137.000	.....
Sept.	26.000	.....	122.000	.....	137.000	.....
Oct.	26.000	.....	122.000	.....	137.000	.....
Nov.	26.000	.....	122.000	.....	137.000	.....
Dec.	(a)	.....	118.447	.....	133.167	.....
Year	24.628	.....	115.530	.....	130.507	.....

(a) No market.

Tin

	New York		London	
	1918	1919	1918	1919
January	85.500	67.702	293.227	248.557
February	92.000	66.801	311.525	223.963
March	(a)	67.934	318.875	236.843
April	(a)	72.500	329.905	225.275
May	(a)	72.500	364.217	234.398
June	(a)	71.240	331.925	238.263
July	(a)	.....	360.347	.....
August	(a)	.....	380.900	.....
September	(a)	.....	343.905	.....
October	(a)	.....	335.543	.....
November	(a)	.....	323.550	.....
December	(a)	.....	267.736	.....
Av. year	(a)	.....	330.138	.....

(a) No average computed.

Lead

	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	6.782	5.432	6.684	5.316	29.00	37.227
February	6.973	5.057	6.899	4.784	29.00	28.675
March	7.201	5.226	7.091	4.992	29.00	27.952
April	6.772	4.982	6.701	4.722	29.00	24.888
May	6.818	5.018	6.704	4.773	29.00	23.852
June	7.611	5.340	7.511	5.070	29.00	22.544
July	8.033	.....	7.750	.....	29.00	.....
August	8.050	.....	7.750	.....	29.00	.....
September	8.050	.....	7.750	.....	29.00	.....
October	8.050	.....	7.750	.....	29.00	.....
November	8.050	.....	7.750	.....	31.20	.....
December	6.564	.....	6.324	.....	40.00	.....
Year	7.413	.....	7.222	.....	30.10	.....

Zinc

	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	7.836	7.272	7.661	7.922	54.000	56.045
February	7.814	6.623	7.639	6.273	54.000	46.150
March	7.461	6.500	7.286	6.150	54.000	38.500
April	6.890	6.465	6.715	6.114	54.000	36.118
May	7.314	6.429	7.114	6.079	54.000	35.477
June	8.021	6.901	7.791	6.551	54.000	36.763
July	8.688	.....	8.338	.....	54.000	.....
August	8.985	.....	8.635	.....	54.000	.....
September	9.442	.....	9.092	.....	54.000	.....
October	8.801	.....	8.451	.....	54.000	.....
November	8.481	.....	8.141	.....	54.100	.....
December	8.163	.....	7.813	.....	56.050	.....
Year	8.159	.....	7.890	.....	54.180	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pittsburgh

	Bessemer‡		Basic‡		No. 2 Foundry	
	1918	1919	1918	1919	1918	1919
January	$37.25	$33.60	$33.95	$31.40	$33.95	$32.40
February	37.25	33.60	33.95	31.40	33.95	32.40
March	37.25	32.54	33.95	31.40	33.95	29.12
April	36.15	29.35	32.95	27.15	33.95	28.15
May	36.20	29.35	33.00	27.15	34.00	28.15
June	36.36	29.35	33.16	27.15	34.16	28.15
July	36.60	.....	33.40	.....	34.40	.....
August	36.60	.....	33.40	.....	34.40	.....
September	36.60	.....	33.40	.....	34.40	.....
October	36.60	.....	34.40	.....	35.40	.....
November	36.60	.....	34.40	.....	35.40	.....
December	36.60	.....	34.40	.....	35.40	.....
Year	$36.67	.....	$33.70	.....	$34.45	.....

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. Exch.†	July 29
Alaska Gold M.	3
Alaska Juneau	2⅜
Am.Sm.&Ref.,com.	85⅝
Am.Sm. & Ref.,pf.	107
Am.Sm.Sec., pf., A.	92
Am. Zinc	28
Am. Zinc, pf.	65
Anaconda	75⅛
Batopilas Min.	1
Bethlehem Steel	97½
Butte & Superior	29
Butte Cop. & Zinc	11⅛
Cerro de Pasco	63⅛
Chile Cop.	27⅛
Chino	48⅛
Colo. Fuel & Iron	50⅛
Crucible Steel	139
Crucible Steel, pf.	103
Dome Mines	14
Federal M. & S.	17
Federal M. & S., pf.	42
Great Nor., ore ctf.	48⅝
Greene Cananea	45⅞
Gulf States Steel	67½
Homestake	‡90
Inspiration Con.	66⅛
International Nickel	30⅛
Kennecott	41⅝
Lackawanna Steel	85
Mexican Petrol.	191
Miami Copper	31⅛
Nat'l Lead, com.	84⅝
National Lead, pf.	111⅛
Nev. Consol.	21⅛
Ontario Min.	8
Ray Con	26⅛
Republic I.&S.,com.	96⅝
Republic I.&S., pf.	106⅛
St. Joseph Lead	16⅛
Sloss-Sheffield	69
Tennessee C. & C.	15⅛
U. S. Steel, com.	112⅛
U. S. Steel, pf.	116⅛
Utah Copper	94
Va. Iron C. & C.	64
Worthington Pump.	81

Boston Curb *	July 29
Boston Ely	1⅛
Boston & Mont.	.89
Butte & Lon'n Dev.	.20
Calaveras	1⅛
Chief Con.	3⅛
Contact	‡.05
Cortez	.12
Crown Reserve	.30
Crystal Cop.	11
Crystal Cop. (new)	.53
Eagle & Blue Bell	2⅛
First Nat. Cop.	2
Gadsen Cop.	4⅛
Houghton Copper	1
Intermountain	‡.05
Iron Blossom	.24
Iron Cap	.13
Majestic	.30
Mexican Metals	.12
Mojave Tungsten	.13
Nat. Zinc & Lead	.09
Nevada-Douglas	.26
New Baltic	3⅛
Oneco	1⅛
Pacific Mines	‡.35
Rex Cons.	‡.09
Yukon Gold	1

San Fran.*	July 29
Alta	‡.08
Andes	.20
Best & Belcher	.19
Caledonia	.22
Challenge Con.	‡.03
Confidence	‡.25
Con. Virginia	2.90
Gould & Curry	.08
Hale & Norcross	‡.20
Jacket-Cr. Pt.	.20
Mexican	.36
Occidental	‡.40
Ophir	1.80
Overman	.08
Savage	‡.22
Sierra Nevada	.21
Union Con.	.17
Utah Con.	‡.03
Belmont	3.50
Jim Butler	.30
MacNamara	.85
Midway	.28
Mont.-Tonopah	.15
North Star	.07
Rescue Eula	.20
West End. Con.	1.77½
Atlanta	.04
Booth	.09
Comb. Frac.	.06
Florence	.65
Jumbo Extension	.12
Kewanas	.04
Nevada Hills	.04
Nevada Packard	.20
Round Mountain	.30
Silver Pick	.07
White Caps	.17

Colo. Springs *	July 29
Cresson Con.	3.31½
Doctor Jack Pot	.03
Elkton Con.	.03⅜
El Paso	.15
Gold Sovereign	‡.02
Golden Cycle	1.66½
Granite	.10
Isabella	.04½
Mary McKinney	.07
Portland	.88
United Gold M.	.17½
Vindicator	.39

Boston Exch.†	July 29
Adventure	2⅜
Ahmeek	90
Algomah	1⅛
Allouez	51½
Ariz. Com.	17⅛
Arnold	‡.28
Bingham Mines	9
Bonanza	‡.20
Butte-Balaklava	.75
Calumet & Ariz.	83½
Calumet & Hecla	470
Carson Hill	‡17½
Centennial	20
Copper Range	60⅛
Daly West	3
Davis-Daly	10⅛
East Butte	19
Franklin	6
Granby	‡73⅛
Hancock	9
Hedley	‡12
Helvetia	5⅛
Indiana	2
Isle Royale	40⅛
Keweenaw	1⅛
Lake	7⅛
La Salle	5⅛
Mason Valley	4⅛
Mass	9⅛
Mayflower	11⅛
Michigan	9
Mohawk	81
New Arcadian	6
New Cornelia	28⅛
New Idria	9⅞
Nipissing	10⅛
North Butte	19
North Lake	1⅛
Ojibway	4
Old Dominion	49
Osceola	70
Quincy	81
St. Mary's M. L.	72
Santa Fe	‡.35
Seneca	24⅛
Shannon	4
Shattuck-Ariz.	‡15⅛
So. Lake	3⅛
So. Utah	.28
Superior	9⅛
Superior & Bost.	3⅛
Trinity	3⅛
Tuolumne	2⅞
U. S. Smelting	69
U. S. Smelting, pf.	49⅛
Utah Apex	3⅛
Utah Con.	12⅛
Utah Metal	4⅛
Victoria	4⅛
Winona	3
Wolverine	90

N. Y. Curb.†	July 29
Alaska B. C. Met.	1⅛
Alaska Mines	⅞
Big Ledge	.75
Butte & N. Y.	⅜
Butte Detroit	‡.03
Caledonia	36
Calumet & Jerome	⅛
Can. Cop. Corpn.	1⅛
Cashboy	.07
Con. Ariz. Sm.	1⅞
Con. Coppermines	7⅛
El Salvador	3⅛
Goldfield Con.	.20
Goldfield Merger	.05⅛
Hecla Min.	5⅞
Howe Sound	21
Louisiana	3⅛
Magma	‡48⅛
Marsh	.10
McKinley-Dar-Sa.	.60
Milford	‡.75
Mother Lode	.48
Nixon Nevada	.25
Ohio Cop.	‡⅞
Rawley	‡2⅛
Ray Hercules	3⅛
Richmond	‡.50
Rochester Mines	‡.20
Silver King of Ariz.	1
So. Am. G. & P.	10⅛
Standard S. L.	1
Stewart	.26
Success	.06
Tonopah	3
Tonopah Divide	7
Tonopah Ex.	2⅛
Tribullion	‡.25
Troy Arizona	‡.10
United Eastern	4⅛
United Verde Ext.	49
Utica Mines	‡.08

Toronto *	July 29
Adanac	.08
Bailey	.03
Beaver Con.	.30
Coniagas	2.00
Hargraves	.02
Kerr Lake	4.75
La Rose	.25
Lake Shore	87½
Min. Corp. of Can.	1.50
Peterson Lake	.10
Teck-Hughes	.15
Temiskaming	.35
Trethewey	.28
Wettlaufer-Lor.	.03
Davidson	‡.68
Dome Exten.	.28
Dome Lake	.15
Hollinger	6.00
McIntyre	1.62½
Newray	.12½
Percu. Crown	.25
Vipond	.20
West Dome	.10

* Bid prices. † Closing prices. ‡ Last quotations.

THE MINING INDEX

Listing Special Articles of Interest and Value to the Miner and Metallurgist

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print) in the original language for the price quoted. Where no price is quoted the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for the foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for $1, 33 for $5, and 100 for $15. When remittances are made in even dollars, we will return the excess over an order in coupons, if so requested.

COPPER

218—BLAST-FURNACE EXPLOSIONS. B. B. Hood. (Eng. and Min. Journ., July 12, 1919; 2 pp., illus.) Account of explosion at Chrome plant of U. S. Metals Refining Co. 20c.

219—CANADA—Deposits of Native Copper in Arctic Canada. J. J. O'Neill. (Min. and Sci. Press, June 14, 1919; 5 pp., illus.) 20c.

220—CHILE—El yacimiento de cobre de Amolánas en el departamento de Copiapó. A. Endter. (Bol. Minero de la Sociedad Nacional de Mineria, Jan., 1919; 6¼ pp.)

221—CUBA—Informe Sobre El Reconocimiento De La Mina De Cobre "La Niña." (Boletin de Minas, Num. 5, 1918; 11¼ pp.)

222—FLOTATION—Recovery of Copper From Flotation by Leaching. Percy R. Middleton. (Min. and Sci. Press, June 7, 1919; 2 pp.) 20c.

223—LAKE SUPERIOR—Development in Lake Superior Milling. C. H. Benedict. (Eng. and Min. Journ., July 5, 1919; 5¼ pp., illus.) 20c.

224—LEACHING—First Year of Leaching by the New Cornelia Copper Co. (Bull A. I. M. E., May, 1919; 1 p.) Discussion of paper previously indexed.

225—LEACHING of Oxidized Copper Ores With Ferric Chloride. R. W. Perry. (Min. and Sci. Press, May 17, 1919; 5 pp., illus.) 20c.

226—MICHIGAN—Native Copper and Silver in the Nonesuch Formation, Michigan. Keijiro Nishio. (Econ. Geol., June, 1919; 11 pp., illus.) 60c.

227—MILL—The Arizona Hercules Copper Co.'s Plant. (Eng. and Min. Journ., June 28, 1919; 4 pp., illus.) 60c.

228—NODULIZING FLOTATION CONCENTRATES in a Rotary Kiln With Powdered Coal. Robert M. Draper. (Chem. and Met. Eng., June 15, 1919; 1 p.)

229—ONTARIO—North Shore of Lake Huron, Ontario. W. H. Collins. (Can. Geol. Surv., Summary Report, 1917, Part E; 5 pp.)

230—QUEENSLAND—Silver Spur Mine Recent Developments and Future Prospecting. Lionel C. Ball. (Queensland Geol. Surv., Bull. 264, 1918; 35½ pp., illus.)

231—REVERBERATORY FURNACES—Prolonging the Life of the Roofs of Reverberatory Furnaces at Anaconda. Oliver E. Jager. (Min. and Sci. Press, July 19, 1919; 1¼ pp., illus.) 20c.

232—SHAFT—Sinking and Concreting Mine Shaft 936 Feet Deep. (Eng. and Min. Journ., July 12, 1919; 5¼ pp., illus.) Procedure at four-compartment shaft of Miami Copper Co. 20c.

233—SOUTHWEST—The Copper Industry of the Southwest. W. Tovote. (Min. Mag., May and June 1919; 20 pp., illus.) 80c.

234—SPEISSES—Treatment of Complex Speisses. Paul Papencordt. (Chem. and Met. Eng., July 1, 1919; 4 pp., illus.) 40c.

GOLD DREDGING, PLACER MINING, ETC.

235—BRITISH COLUMBIA—Cariboo Placers and Lodes. J. A. MacPherson. (Min. and Eng. Rec., May 1919; 4¼ pp., illus.) 40c.

236—BRITISH COLUMBIA—Notes on the Placer Mines of Cariboo, B. C. J. B. Tyrrell. (Econ. Geol., June, 1919; 10¼ pp., illus.) 60c.

237—OREGON—Placer Mining in Oregon. A. E. Kellogg. (Eng. and Min. Journ., July 19, 1919; 1½ pp., illus.) 20c.

GOLD AND SILVER—GENERAL

238—MICHIGAN—Native Copper and Silver in the Nonesuch Formation, Michigan. Keijiro Nishio. (Econ. Geol., June, 1919; 11 pp., illus.) 60c.

239—MILLING in the San Juan, Colorado. Clifford R. Wilfley. (Eng. and Min. Journ., June 28, 1919; 2¾ pp., illus.) 60c.

240—NEVADA—Revival of Silver Mining at Cherry Creek, Nev. Geo. H. Ryan. (Salt Lake Min. Rev., May 30, 1919; 3 pp., illus.) 20c.

241—ONTARIO—North Shore of Lake Huron, Ontario. W. H. Collins. (Can. Geol. Surv., Summary Report, 1917, Part E; 5 pp.)

242—ONTARIO—The Origin of the Gold Deposits of Matachewan District, Northern Ontario. H. C. Cooke. (Econ. Geol., June, 1919; 20½ pp.) 60c.

243—ONTARIO—The Wasapika Gold Area. Reginald E. Hore. (Can. Min. Journ., July 9, 1919; 12 pp., illus.) 20c.

244—PERU—Estado Actual Y Porvenir De La Industria Minera En Los Departamentos Del Sur. Carlos Basadre y G. (Bol. del Cuerpo de Ingenieros de Mines del Peru, No. 93, 1918; 64 pp., illus.

245—QUEENSLAND—Silver Spur Mine. Recent Developments and Future Prospecting. Lionel C. Ball. (Queensland Geol. Surv., Bull. 264, 1918; 35½ pp., illus.)

246—RAND'S ORE RESERVES, The. (So. Afri. Min. and Eng. Journ., June 7, 1919; 1 p.; to be continued,) 40c.

247—SOUTH AFRICA—The Greater Heidelberg Goldfields. (So. Afri. Min. and Eng. Journ., Mar. 1, 8, 15, 22, 29, Apr. 5, 12, 19, 1919; 24 pp., illus.)

IRON ORE DEPOSITS, MINING, ETC.

248—BRIQUETTING Magnetite Concentrate. F. H. Mason. (Min. and Sci. Press, July 12, 1919; 1 p.) 20c.

249—CUBA—Relaciones Geológicas y Génesis de las Minas de Hierro Especular de Santiago de Cuba. James P. Kimball. (Boletin de Minas, Num. 5, 1918; 12¼ pp.)

250—CUBA—Reseña Historica Scbre La Mineria En Oriente, Cuba. (Boletin de Minas, No. 5; 13½ pp.) Continuation.

251—DOCK—New York Dock For Iron Ore at Port Henry, N. Y. (Iron Tr. Rev., May 15, 1919; 2 pp., illus.) 20c.

252—UNITED KINGDOM—Recent Iron-Ore Developments in the United Kingdom. (Journ. Soc. Chem. Ind., June 30, 1919; 3¾ pp., illus.)

IRON AND STEEL METALLURGY

253—ANALYSIS—A Study of the Goutal Method for Determining Carbon Monoxide and Carbon Dioxide in Steels. J. R. Cain and Earl Pettijohn. (Technologic Papers of the Bureau of Standards, No. 126; 8 pp.)

254—ACID HEARTH AND SLAG, The. J. H. Whiteley and A. F. Hallimond. (Advance Copy, Iron and Steel Inst., May, 1919; 44 pp., illus.)

255—ANALYSIS—Determination of Uranium, Zirconium, Chromium, Vanadium and Aluminum in Steel. Charles Morris Johnson. (Chem. and Met. Eng., May 15 and June 1, 1919; 4 pp.)

256—BLAST-FURNACE SLAG—Manufacture of Cement From Blast-Furnace Slag. Wm. Poole. (Proc. Austral. Inst. M. E., Sept. 30, 1919; 20 pp.; reprinted in Queensland Govt. Min. Journ., Apr. 15, 1919.)

257—BRITISH STEEL OUTPUT Up 39 Per Cent. Joseph Horton. (Iron Tr. Rev., May 15, 1919; 2 pp., illus.)

258—CARBON STEELS—The Experimental Investigation of the Influence of the Rate of Cooling on the Hardening of Carbon Steels. A. M. Portevin and M. Garvin (Advance Copy, Iron and Steel Inst., May, 1919; 90 pp., illus.)

259—CARBURIZATION—The Carburization of Iron at Low Temperatures. Andrew McCane. Advance Copy, Iron and Steel Inst., May, 1919; 5 pp., illus.)

260—CASE-HARDENING PROCESS, Improvements in the. D. Hanson and J. E. Hurst. (Advance Copy, Iron and Steel Inst., May, 1919; 18 pp., illus.)

261—CAST IRON—Oxygen in Cast Iron and Its Application. Wilford L. Stork. (Bull. A. I. M. M. E., June, 1919; 5¼ pp.) 40c.

262—ELECTRIC FURNACES—Grands Fours Electriques Pour La Fusion De L'Acier. Victor Stobie. (Journ. Du Four Electrique, June, 1919; 2 pp.) 40c.

263—FLAKY FRACTURES and Their Possible Elimination. Haakon Styri. (Chem. and Met. Eng., May 1, 1919; 6 pp.)

264—FLAKY STEEL—Flaky and Woody Fractures in Nickel-steel Gun Forgings—Micro-Structural Features of Flaky Steel. (Bull. A. I. M. E., May, 1919; 10¾ pp., illus.)

265—HEAT TREATMENT.—Relative Size in Heat Treatment. T. G. Straub. (Iron Age, July 17, 1919; 2 pp.) 20c.

266—HIGH-SPEED STEEL—The Manufacture and Working of High-Speed Steel. J. H. Andrew and G. W. Green. (Advance Copy, Iron and Steel Inst., May, 1919; 31½ pp., illus.)

267—HIGH-SPEED STEELS—The Molecular Constitutions of High-Speed Tool Steels and Their Correlations with Lathe Efficiencies. John Oliver Arnold and Fred Ibbotson. (Advance Copy, Iron and Steel Inst., May, 1919; 23½ pp., illus.)

268—HIGH SPEED STEEL—The Properties of High Speed Steel. G. J. Horvitz. (Iron Age, June 26, 1919; 4 pp., illus.) From a paper before Am. Steel Treaters' Soc. 20c.

269—IRON-CARBON ALLOYS—Graphitisation in Iron-Carbon Alloys. Kuniichi Tawara and Genshichi Asahara. (Advance Copy, Iron and Steel Inst., May, 1919; 15¼ pp.)

270—MACRO-ETCHING and Macro-Printing. J. C. W. Humfrey. (Advance Copy, Iron and Steel Inst., May, 1919; 13¼ pp., illus.)

271—OPEN HEARTH STEEL FURNACES, Water-cooled Equipment for. (Bull. A. I. M. M. E., May and June, 1919; 9 pp.) Discussion of paper of Wm. C. Coffin, previously indexed.

272—PRODUCTION—The World's Iron and Steel Output. (Ironmonger, June 7, 1919; 1 p.). Memorandum from Nat. Federation of Iron and Steel Manufacturers. 40c.

273—RAILS—A Metallographic Investigation of Transverse-fissure Rails with Special Reference to High-Phosphorus Streaks. (Bull. A. I. M. M. E., June, 1919; 5½ pp., illus.) Discussion of the paper of George F. Comstock, previously indexed

274—REFRACTORIES—Basic Refractories for the Open Hearth. (Bull. A. I. M. M. E., May and June, 1919; 4½ pp.) Discussion of a paper by J. Spotts McDowell, previously indexed. 60c.

275—WAR—German Destruction in Northern France. (Iron Age, July 10, 1919; 6¼ pp., illus.) 20c.

276—WAR Remakes Steel Map of Europe. A. O. Backert. (Iron Tr. Rev., June 26, 1919; 6 pp., illus.) 20c.

277—X-RAYS—The Use of X-Rays in Metallurgy. (Iron Age, June 19, 1919; 2½ pp.) Discussion at a recent meeting of the Faraday Soc. and the Roentgen Soc. 20c.

LEAD AND ZINC

278—AUSTRALIA—A Brief Résumé of the Smelting Plant at the Sulphide Corporation Limited Works, Cockle Creek, N. S. W. Guy Courtney. (Proc. Austral. Inst. M. E., Sept. 30, 1918; 4 pp.)

279—BLUE POWDER FORMATION, Effect of Sodium Chloride on. Reginald S. Dean. (Chem. and Met. Eng., June 15, 1919; ¾ p.) 40c.

280—ELECTROMETALLURGY—Etat actuel des Industries Electrometallurgiques et Electrochimiques du Zinc. (Journ. du Four Electrique, June, 1919; 1½ pp.) 40c.

281—ELECTROMETALLURGY—L'Electrometallurgie du Zinc. Procédés électrolytiques. (Metaux, Alliages et Machines, 1919; 1½ pp.) 40c.

282—MISSOURI, ARKANSAS, KANSAS AND OKLAHOMA, Zinc Industry of. Otto Ruhl. (Eng. and Min. Journ., June 28, 1919; 1¼ pp.) Address before Am. Zinc Inst. 60c.

283—MISSOURI-KANSAS-OKLAHOMA ZINC AND LEAD DISTRICT, Conditions in the. W. E. Henry. (U. S. Bureau of Mines, July, 1919; 13½ pp.)

284—NEW USES For Zinc. George S. Harney. (Eng. and Min. Journ., July 19, 1919; 2 pp.) From an address before the Am. Zinc Inst. 20c.

285—ROASTING AND MAGNETIC SEPARATION of Wisconsin Zinc Ores, The. E. G. Deutman. (Eng. and Min. Journ., June 28, 1919; 4¼ pp., illus.) 60c.

286—SMELTING—The Smelting of Zinc Ores. (Journ. Soc. Chem. Ind., May 31, 1919; 1½ pp.) From a lecture delivered by J. C. Moulden at Royal School of Mines.

287—WAR'S INFLUENCE on the Zinc Industry. Pope Yeatman. (Eng. and Min. Journ., July 5, 1919; 3 pp.) Address before Am. Zinc. Inst., June 9, 1919. 20c.

OTHER METALS

288—ALUMINUM—Evolution of the Lynite Laboratories of the Aluminum Castings Co. (Iron Age, July 17, 1919; 5½ pp., illus.) 20c.

289—ALUMINUM—Heat Treatment of Duralumin. P. D. Merica, R. G. Waltenberg and H. Scott. (Bull. A. I. M. and M. E., June, 1919; 36¼ pp., illus.) 40c.

290—ALUMINUM—Progress in Aluminum Casting. (Metal Ind., May, 1919; 3 pp., illus.) Describes Plant of McAdamite Aluminum Co. 20c.

291—CHROME—Maryland Sand Chrome Ore. Joseph T. Singewald, Jr. (Econ. Geol., May, 1919; 9 pp., illus.) 60c.

292—MANGANESE—Cost of producing Ferro-Grade Manganese Ores. C. M. Weld and W. R. Crane. (U. S. Bureau of Mines, Minerals Investigations Series, No. 13, 1919; 21¼ pp.)

293—MANGANESE—Reseña Historica Sobre la Mineria en Oriente, Cuba. (Boletin de Minas, No. 5; 13¼ pp.) Continuation.

294—MANGANESE—Uses of Manganese Other Than for Steel Making. W. C. Phelan. (U. S. Bureau of Mines, Mineral Investigation Series, No. 16, May, 1919; 14 pp.)

295—MOLYBDENITE—Colorimetric Estimation of Molybdenite in Low-Grade Ores and Tailings. G. Spurge. (Chem., Eng. and Min. Rev., June 5, 1919; 1 p.) 40c.

296—MOLYBDENITE DEPOSITS in Ireland. (Statist, June 21, 1919; 1 p.) 40c.

297—PLATINUM—Comparative Tests of Palau and Rhotanium Ware as Substitutes for Platinum Laboratory Utensils. L. J. Gurevich and E. Wichers. (Journ. Ind. and Eng. Chem., June, 1919; 3 pp.)

298—SELENIUM—Selenic Acid and Copper Selenate. L. M. Dennis and J. P. Koller. (Jour. Am. Chem. Soc., June, 1919; 21 pp.)

299—THALLIUM—Note on the Extraction of Thallium from Pyrites Flue Dust. George Sisson and J. S. Edmondson (Journ. Soc. Chem. Ind., Mar. 31, 1919; ¾ p.)

300—TIN—Ancient Tin Mines of the Transvaal. Max Baumann. (Jour. Chem., Met. and Min. Soc. of So. Afr., Apr., 1919; 4¾ pp., illus.) Discussion of paper previously indexed.

301—TIN—Slime Treatment on Cornish Frames. S. J. Truscott. (Bull. I. of M. and M., June, 1919; 1¼ pp.) Contributed remarks on paper previously indexed.

302—TIN—Tasmanian Production of Tin Oxide. Cyril W. Gudgeon. (Chem., Eng. and Min. Rev., May 5, 1919; 1 p.) 40c.

303—TUNGSTEN—Thermo Electric Ore Reduction Corporation, Limited. (Queensland Govt. Min. Journ., May 15, 1919; 2¾ pp., illus.) 40c.

304—VANADIUM—A Proposed Metallurgical Process for the Treatment of Vanadinite for the Recovery of Lead and Vanadium. J. E. Conley. (Chem. and Met. Eng., May 15, 1919; 4½ pp., illus.)

NONMETALLIC MINERALS

305—ASPHALTS—Melting Point of Asphalts. Leland M. Proctor. (Chem. and Met. Eng., July 15, 1919; 2¾ pp., illus.) 40c.

306—DIAMONDS—Notes on the Geology of the Diamond Region of Bahia, Brazil. Roderic Crandall. (Econ. Geol., May, 1919; 24½ pp., illus.) 60c.

307—DIAMONDS—The South-West Protectorate. Diamond Taxation. (South African Journ. of Ind., Apr., 1919; 4 pp.)

308—ELATERITE—Occurrence of Elaterite, or Elastic Bitumen, in a Fluorite Vein at Madoc, Ont. Cyril W. Knight. (Can. Min. Journ., June 4, 1919; 1 p.) 20c.

309—GRAPHITE In Port Elmsley District, Lanark County, Ontario. M. E. Wilson. (Can. Geol. Surv., Summary Report, 1917, Part E; 13½ pp.)

310—GRAPHITE MINING AND MILLING in Alabama. H. P. H. Brumell. (Eng. and Min. Journal, July 5, 1919; 1¾ pp.) 20c.

311—LIME in 1917. G. F. Loughlin. (Mineral Resources of the U. S., 1917, Part II; 31 pp.)

312—MAGNESITE—The Hydro-Magnesite Deposits of British Columbia. Ronald Campbell Campbell-Johnston. (Min Journ., May 17, 1919; 2¼ pp.) 40c.

313—MICA AND FELDSPAR—North Shore of Lake Huron, Ontario. W. H. Collins. (Can. Geol. Surv., Summary Report, 1917, Part E; 5 pp.)

314—MOLDING SAND—Production of Albany Molding Sand. Robert W. Jones. (Iron Age, June 5, 1919; 2¾ pp.) 20c.

315—NITRATES—The Prieska Nitrates. (So. Afr. Min. and Eng. Journ., Apr. 12, 1919; 2¼ pp., illus.) 40c.

316—PHOSPHATE—On a New Phosphate Deposit in the Howqua District, near Mansfield, Victoria. Ernest W. Skeats and E. O. Teale. (Proc. Austral. Inst. M. E., Dec., 1918; 2¼ pp.)

317—PHOSPHATE INDUSTRY, The. James Hendrick. (Journ. Soc. Chem. Ind., May 15, 1919; 2¾ pp.)

318—POTASH—The Passing of the American Potash Famine. P. G. H. Boswell. (Journ. So. Chem. Ind., June 16, 1919; 1¾ pp.)

319—PYRITE DEPOSITS in Ohio Coal. W. M. Tucker. (Econ. Geol., May, 1919; 21½ pp., illus.) 60c.

320—SALT—The Salt Industry and the Possibilities for the Future Development in Canada. L. Heber Cole. (Can. Min. Rev., May 14, 1919; 11 pp., illus.) 20c.

321—SULPHUR—Flotation and Retorting of Sulphur. P. F. Junehomme. (Eng. and Min. Journ., June 28, 1919; ¾ p.) 60c.

PETROLEUM AND NATURAL GAS

322—ALBERTA—Peace River Oil. J. J. Rutledge. (Can. Min. Journ., June 4, 1919; 1½ pp.) 20c.

323—DRILLING—Percussion Plant for Oil-Well Drilling. (Engineering, June 27, 1919; 4 pp., illus.) 40c.

324—GEOLOGY—Petroliferous Provinces. E. G. Woodruff. (Bull. A. I. M. and M. E., June, 1919; 5½ pp.) 40c.

325—OIL SHALE—The Winning of Oil From Rocks. Arthur J. Hoskin. (Min. and Sci. Press, May 24, 1919; 6¼ pp., illus.) 20c.

326—OIL SHALES—Value of American Oil Shales. Charles Baskerville. (Bull. A. I. M. M. E., June, 1919; 4 pp.) 40c.

327—PRODUCTION, ETC.—Petroleum in April and March. (Eng. and Min. Journ., July 12, 1919; 1¼ pp.) U. S. Geological Survey data. 20c.

328—WATER—Sealing Water in California Oil Fields. Seth S. Langley. (Eng. and Min. Journ., July 5, 1919; 7½ pp., illus.) 20c.

329—WATER TROUBLES in the Mid-Continent Oil Fields and Their Remedies. (Bull. A. I. M. M. E., May, 1919; 3 pp.) Discussion of a paper by Dorsey Hager and G. W. McPherson.

ECONOMIC GEOLOGY—GENERAL

330—INDIA—Notes on Structure and Stratigraphy in the North-West Punjab. E. S. Pinfold. (Rec., Geol. Surv. of India, Dec., 1918; 22 pp.)

331—ORE DEPOSITS—The Genesis of Igneous Ore Deposits. W. H. Goodchild. (Bull. I. M. M. E., June, 1919; 12 pp.)

MINING LAW

332—PROPERTY LINES—The Location of Property Lines. Wm. C. Wattles. (Col. School of Mines Mag., June, 1919; 5½ pp.) 40c.

333—WORKMEN'S COMPENSATION. Chesla C. Sherlock. (Eng. and Min. Journ., July 19, 1919; 1 p.) 20c.

MINING—GENERAL

334—ACCIDENTS—Metal-Mine Accidents in the United States During the Calendar Year 1917. Albert H. Fay. (Tech. paper 224, U. S. Bureau of Mines; 79½ pp.)

335—BLASTING—Electric Blasting Equipment. L. D. Rowell. (Eng. and Min. Journ., July 5, 1919; 2 pp., illus.) 20c.

336—BLASTING PRACTICE in Joplin District. R. H. Summer. (Du Pont Mag., July, 1919; 2½ pp.) 20c.

337—CABLES—Oiling Mine Cables in Place. Wm. Fleet Robertson. (Min and Sci. Press, May 31, 1919; 1¼ pp.) Paper read before Can. Min. Inst. 20c.

338—COST KEEPING for Small Metal Mines. J. C. Pickering. (Tech. Paper 223, U. S. Bureau of Mines, 1919; 46 pp.)

339—CURVES—Laying Out Short-Radius Curves. John Faber Hanst. (Eng. and Min. Journ., July 19, 1919; ¾ p., illus.) 20c.

340—EXPLORATION—Progress in Methods of Exploration. Hugh M. Roberts. (Min. and Sci. Press, July 12, 1919; 4½ pp.) 20c.

341—EXPLOSIVES—The Use of Explosives in Mines. H. Y. Russell. Bull. Can. Min. Inst., June, 1919; 8 pp.) 40c.

342—HOISTING—Electric Hoisting Equipment at the Butte & Superior Mine. Oliver E. Jager. (Min and Sci. Press, July 5, 1919; 5 pp., illus.) 20c.

343—ORE RESERVES—The Application of the Theory of Probability in the Determination of Ore Reserves. G. A. Watermeyer. (Journ. Chem., Met. and Min. Soc. of So. Afr., Apr., 1919; 7½ pp., illus.) Discussion of paper previously indexed.

344—PERU in 1917. (Min. Journ., June 21, 1919; 1¼ pp.) 40c.

345—SHAFT—Sinking and Concreting Mine Shaft 936 Feet Deep. (Eng. and Min. Journ., July 12, 1919; 5¼ pp., illus.) Procedure at four-compartment shaft of Miami Copper Co. 20c.